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telecommunication journal

OFFICIAL ORGAN OF THE INTERNATIONAL TELECOMMUNICATION UNION

Journal des Télécommunications
Boletín de Telecomunicaciones

OCTOBER 1962

Vol. 29 — No. 10

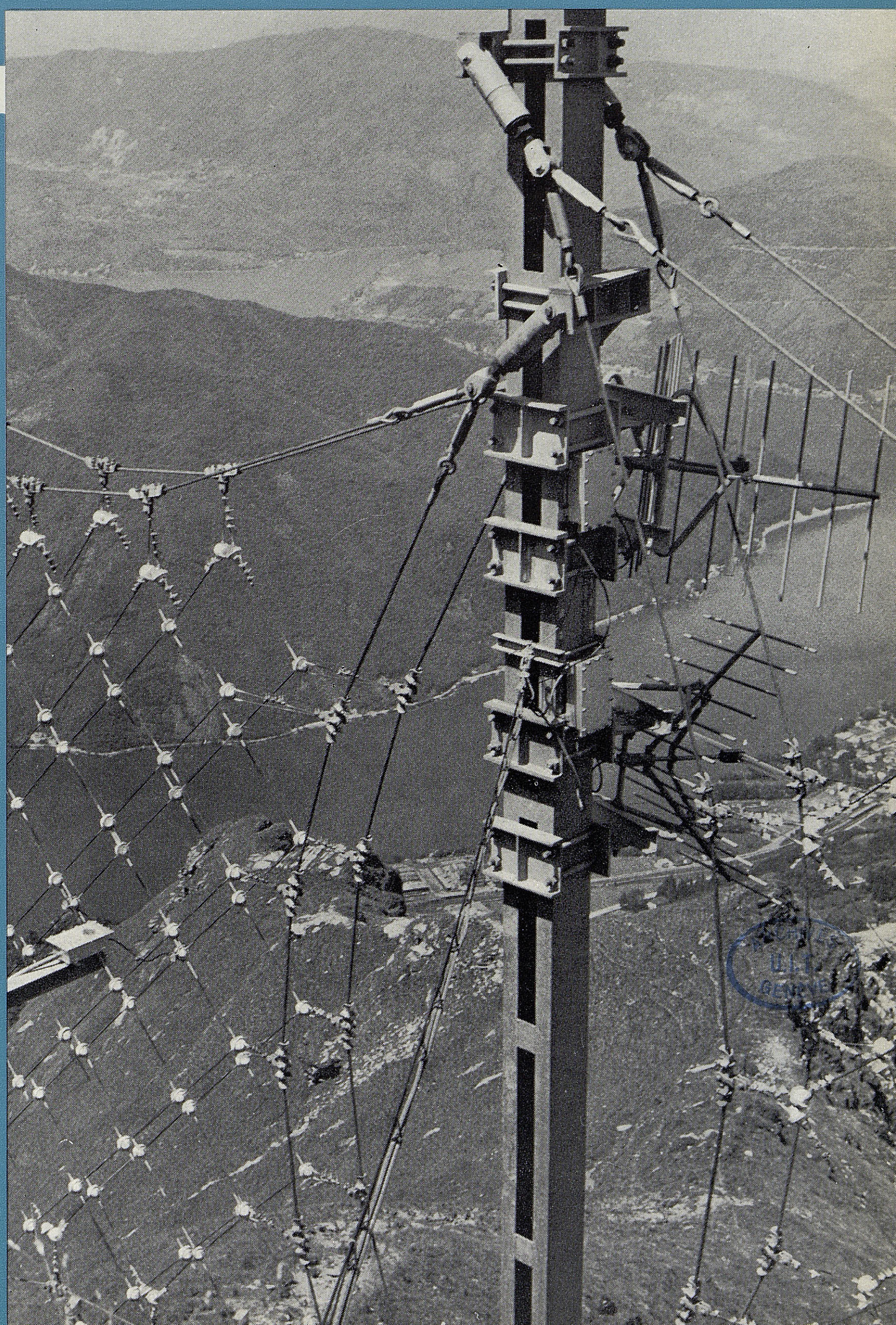
In this issue :

GERALD C. GROSS
Space communications — the need and scope for action

M. JOACHIM and Y. Y. MAO
Ways to space communications

The Telstar story

Telepersonality
No. 22—Mahmud Mohammed Riad



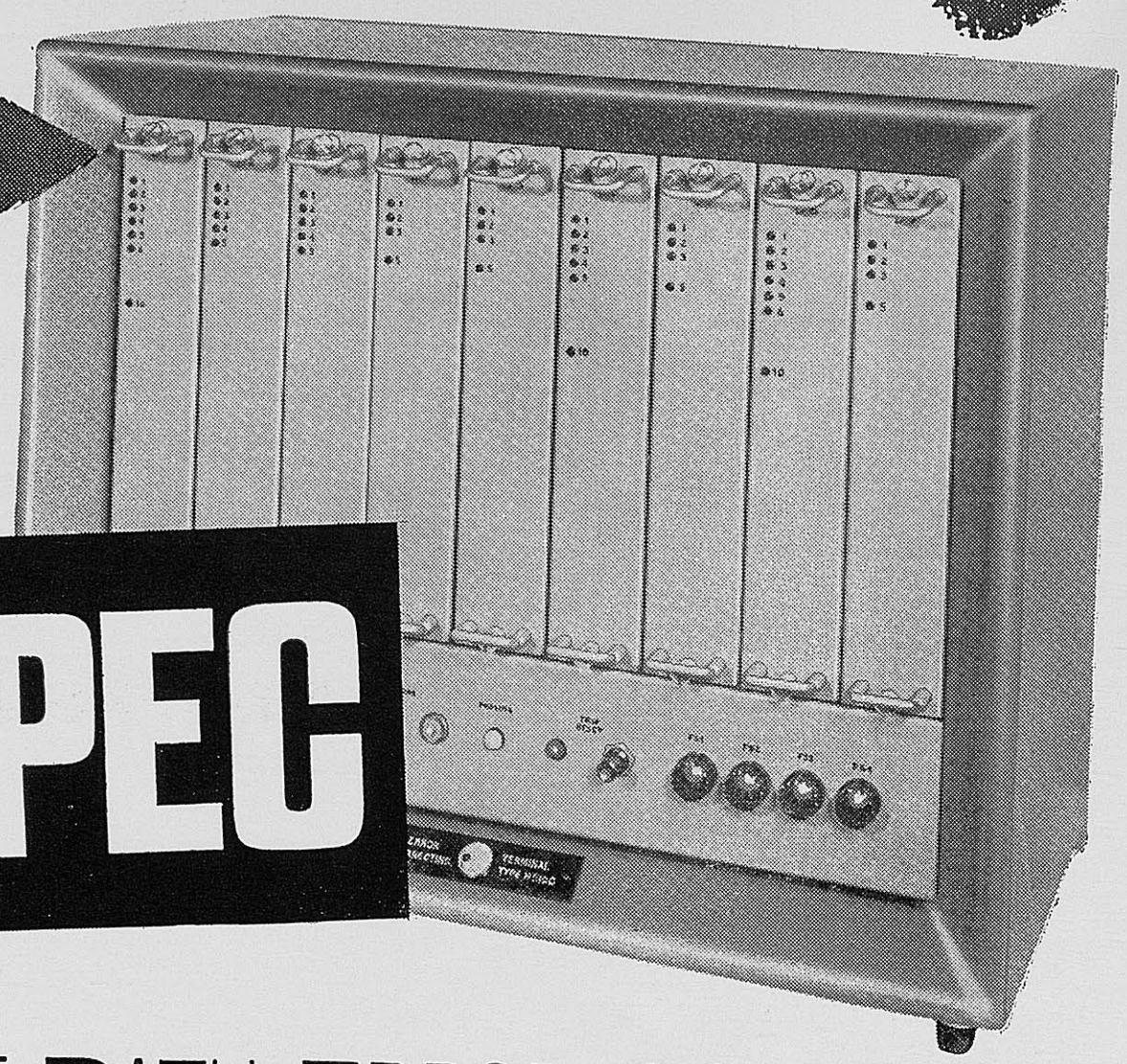
ANTENNAS OVER THE LAKE OF LUGANO →

(Photo : Swiss PTT)

U.I.T. GENEVE

LOW BUDGET
ERROR PROOF TELEGRAPHY

with the **NEW**
MARCONI



AUTOSPEC

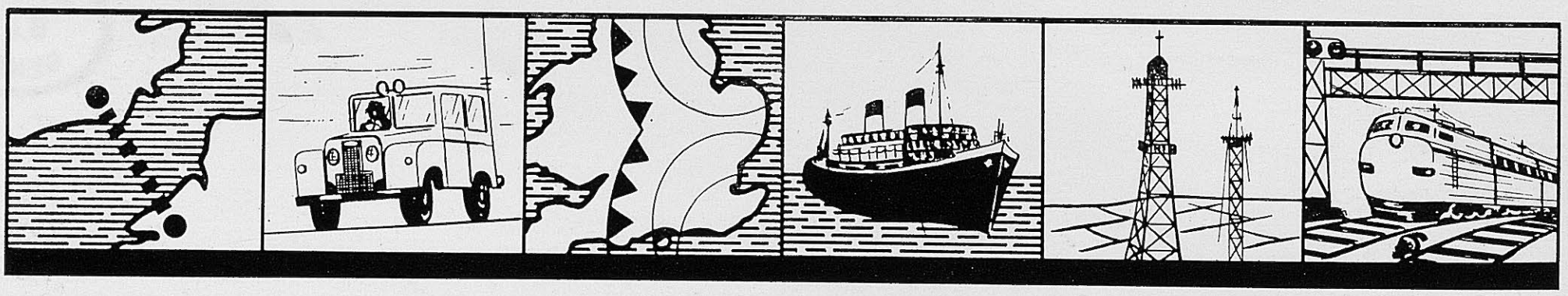
AUTOMATIC SINGLE PATH ERROR CORRECTION

- **RUGGED**
- **UNATTENDED OPERATION**
- **SOLID STATE** ● **LOW COST**
- **COMPACT** ● **SIMPLE**
- **NO MODIFICATION TO EXISTING INSTALLATIONS**

AUTOSPEC provides error proof telegraph working on services where no return path is required or on low capacity point-to-point circuits

AUTOSPEC is the first single path error corrector to include automatic correction without the need for repetition

AUTOSPEC is a product of the same design team responsible for the production of the world famous AUTOPLEX



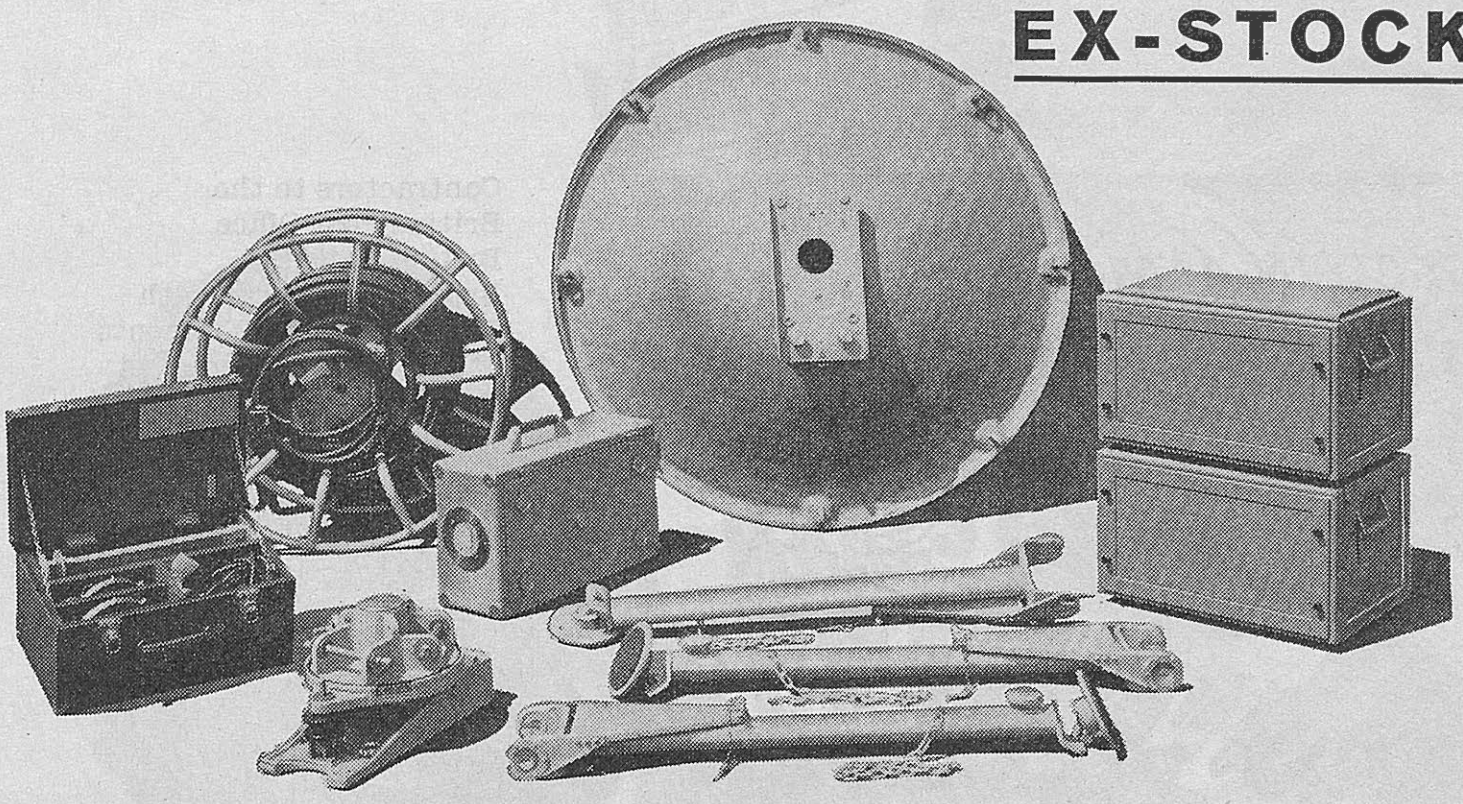
MARCONI'S WIRELESS TELEGRAPH CO. LIMITED · CHELMSFORD · ESSEX · ENGLAND

H9

STC

7000 Mc/s PORTABLE OUTSIDE BROADCAST LINK FOR TELEVISION

NOW AVAILABLE **EX-STOCK**



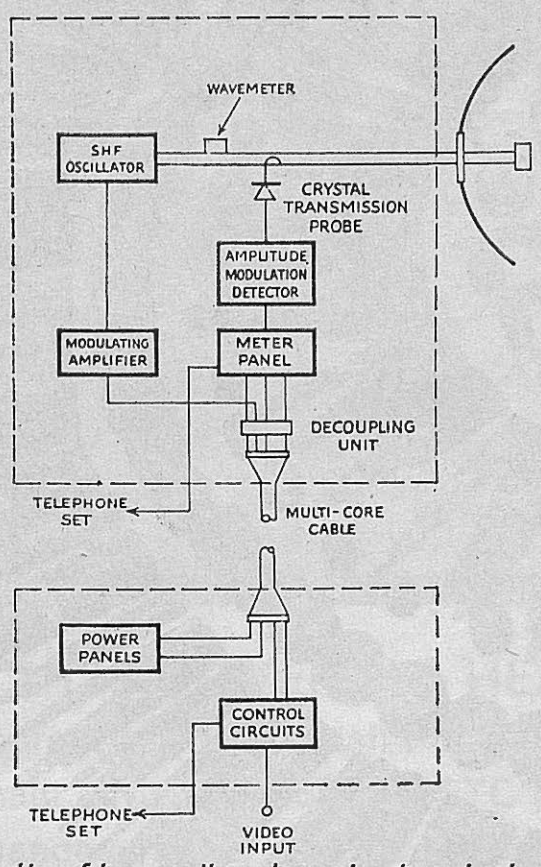
Receive terminal disassembled into its component parts for transport.

This equipment comprises a number of easily portable units forming independent frequency-modulated transmit and receive terminals operating in the frequency range 6850 Mc/s to 7300 Mc/s.

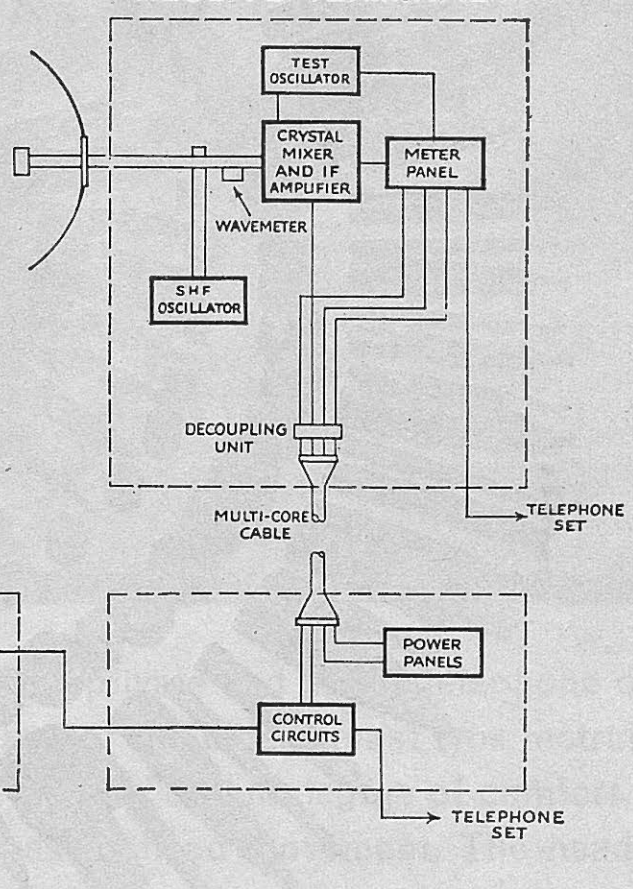
The design is based on considerable experience gained since 1948 with STC portable television links supplied to the British Broadcasting Corporation, and administrations in various parts of the world.

- Suitable for 405, 525, or 625 line, monochrome or colour, television picture transmission.
- C.C.I.R. approved i.f. of 70 Mc/s.
- Highly efficient electrical screening allows working on same mast as high-power television transmitter.
- High frequency stability without a.f.c. circuits.
- Has built-in lining-up equipment.
- Range 30 to 40 miles. Extended by connecting a limited number of links in tandem.

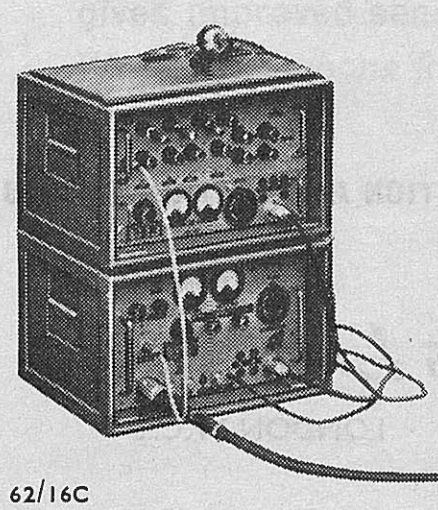
TRANSMIT TERMINAL



RECEIVE TERMINAL



Block schematic of transmit and receive terminals.



used by the BBC

STC engineers can advise on all problems concerning radio links for both television and telephone transmission.

Ask for leaflet C/2039

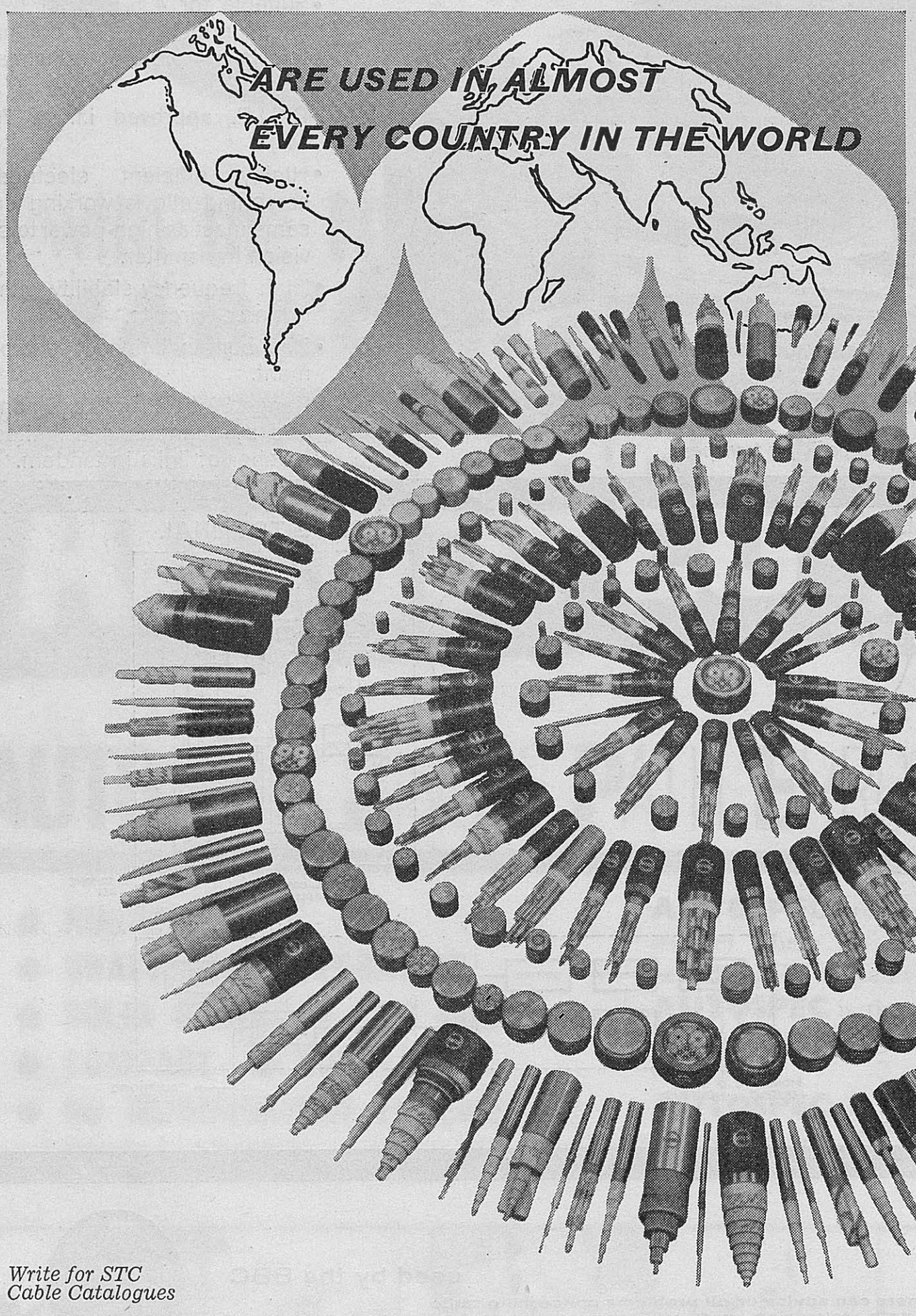
Standard Telephones and Cables Limited

TRANSMISSION SYSTEMS GROUP
NORTH WOOLWICH · LONDON · E.16

62/16C

STC

communication and control cables



Contractors to the
British Post Office
British Railways
British Commonwealth
Government Departments
and numerous Home and
Overseas administrations

Write for STC Cable Catalogues

STC DEVELOP, MANUFACTURE, AND INSTALL ALL TYPES OF COMMUNICATION AND CONTROL CABLES

Standard Telephones and Cables Limited

CABLE AND WIRE GROUP: CONNAUGHT HOUSE · 63 ALDWYCH · LONDON W.C.2

62/1BH

STC LIGHTWEIGHT HEADSETS, designed for use by private and public telephone operators and approved by the British Post Office, are fast superseding the use of the older breast type instruments. The main advantages of this STC product are extraordinary light weight, a high degree of comfort, stability and manoeuvrability and constant level of transmission regardless of head movement. The headsets are made in black, grey or ivory nylon plastic which is virtually unbreakable.

The "Rocking Armature" principle—an important STC development in telephone receiver design—which gives improved sensitivity and frequency response has been incorporated into these instruments.

Write or telephone for leaflet D/104

62/1D

Standard Telephones and Cables Limited

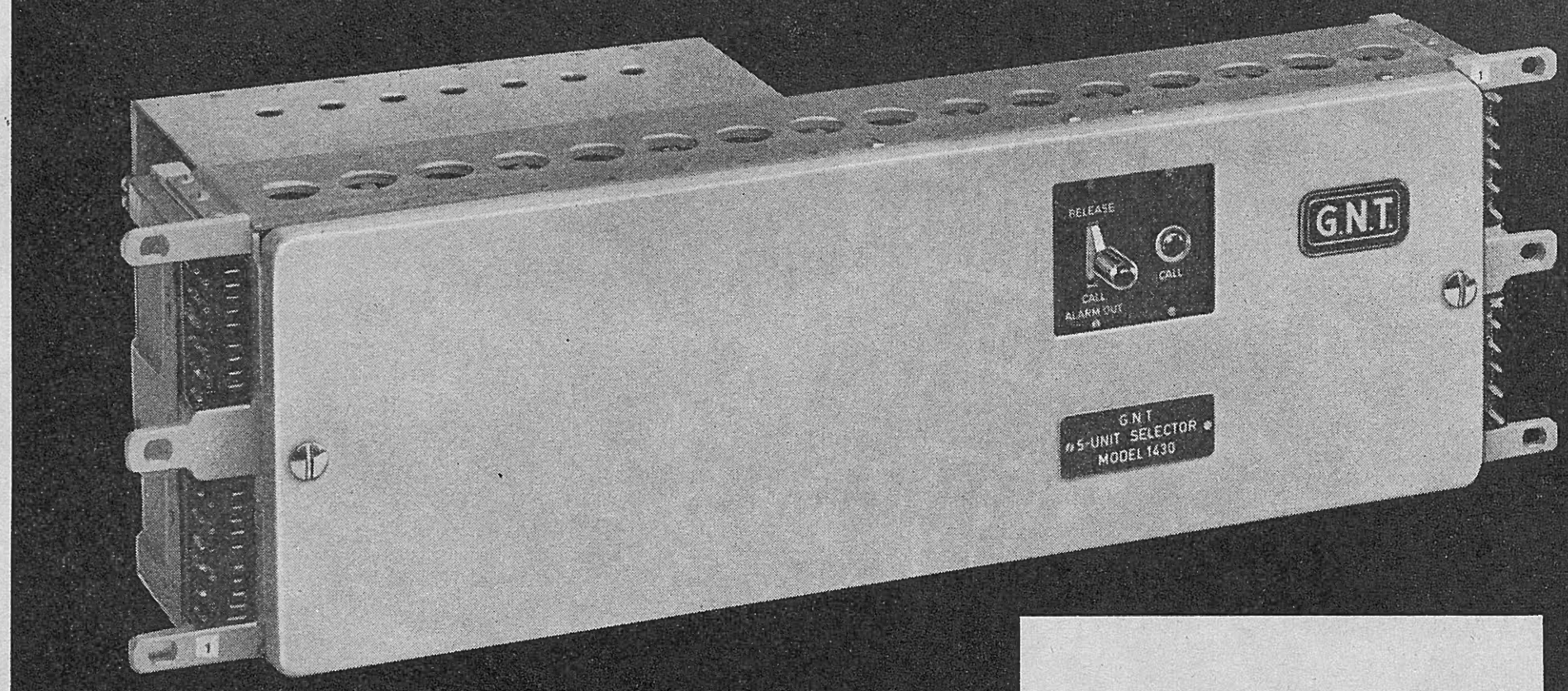
TELEPHONE SWITCHING DIVISION

OAKLEIGH ROAD · NEW SOUTHGATE · LONDON · N11 · ENTERPRISE 1234

G.N.T.

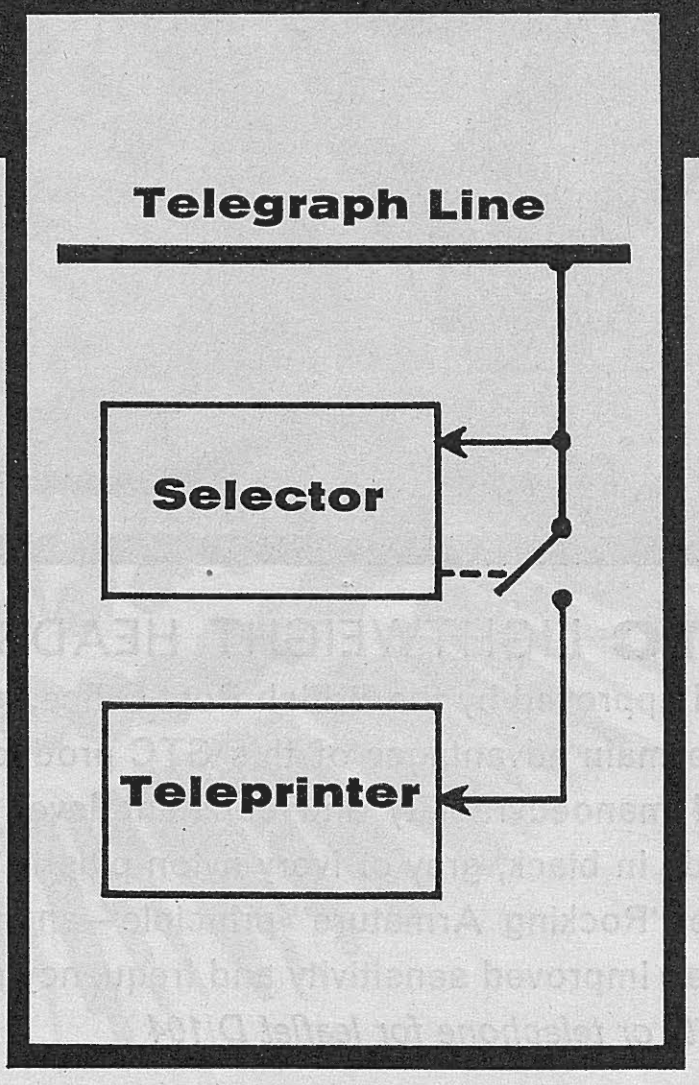
5-UNIT SELECTOR MODEL 1430

For selective calling on omnibus telegraph circuits



SPECIFICATION

- Input signal speed 50 bauds, other speeds on request
- Accepts incoming signals having as much as 45% distortion
- Start polarity plus or minus 60 to 80 volts
- Available for double current, or, if requested, single current
- Responds to call signals consisting of up to 7 characters, for instance ZZZZ... or ZCZC... where Z and C may be any character of the 5-unit alphabet
- Complete unit, including plug-in printed circuits, mounted in 5 1/4″ panel (51-type New Equipment Practice - G.P.O. Standard) thus facilitating easy installation and maintenance



GREAT NORTHERN TELEGRAPH WORKS

SYDHAVNS PLADS 4 · COPENHAGEN SV · DENMARK
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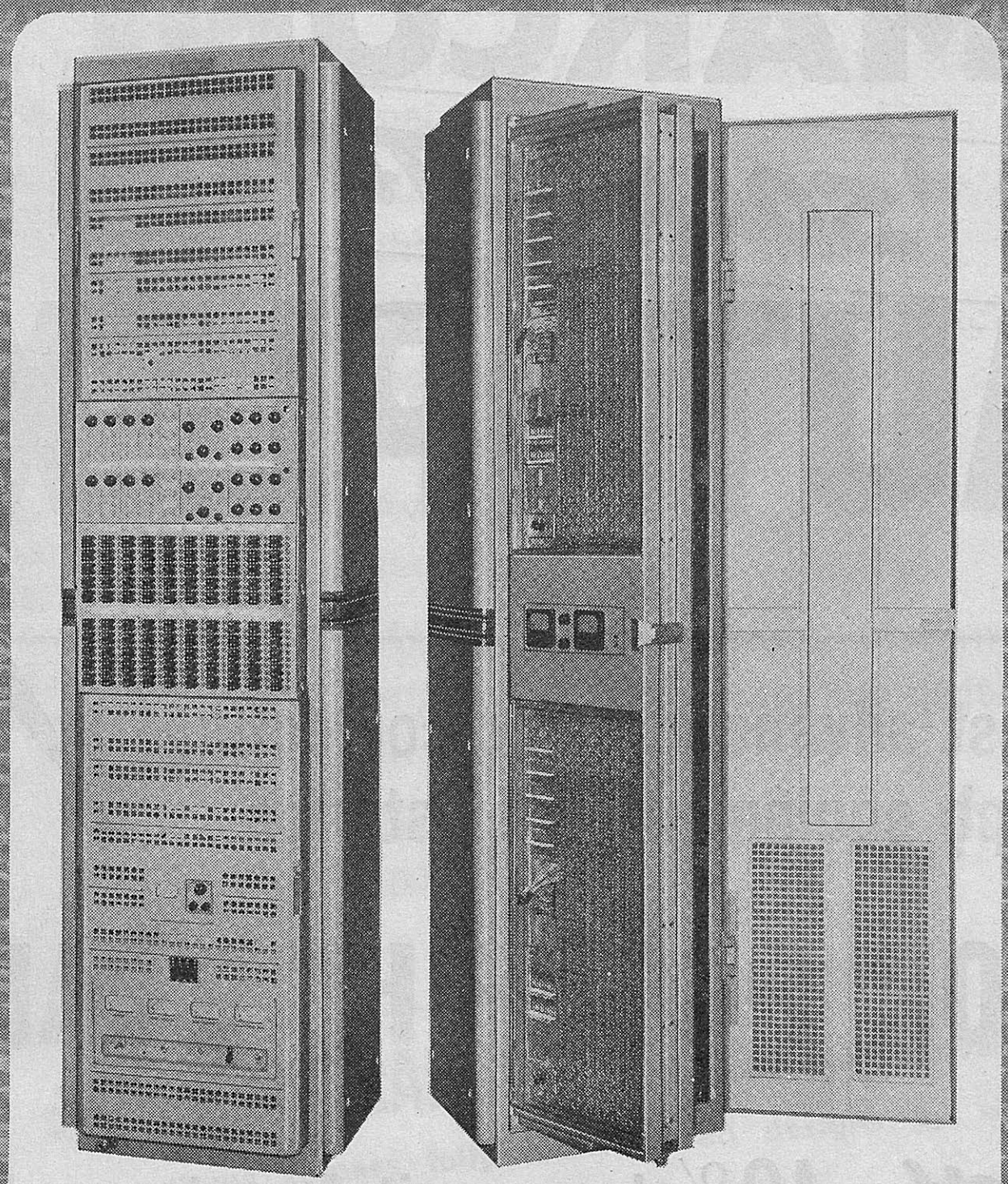


The Unique

PARAMETRONIC MUX/ARQ

The Mitsubishi Model TZ-3: MUX/ARQ is the only PARAMETRONIC MUX/ARQ in the world. It is famous for high reliability, stable performance, extra long life, thermostability and easy maintenance. Specifications: 4-channel or 2 x 2 channel operation • Automatic and manual phasing • Channel subdividers included in line with CCIR recommendation • Remote supervisory and easy control • Monitoring and patching possible • Accessible construction • Compatible with other ARQ equipment and accessories.

MITSUBISHI ELECTRIC MANUFACTURING COMPANY

Head Office : Tokyo Building, Marunouchi, Tokyo

Cable Address : MELCO TOKYO

NEW MARCONI 'SOLID STATE' AUTOPLEX

The most advanced error correcting telegraph equipment in existence

ERROR PROOF HF TRAFFIC

WITH

40% less capital cost per channel

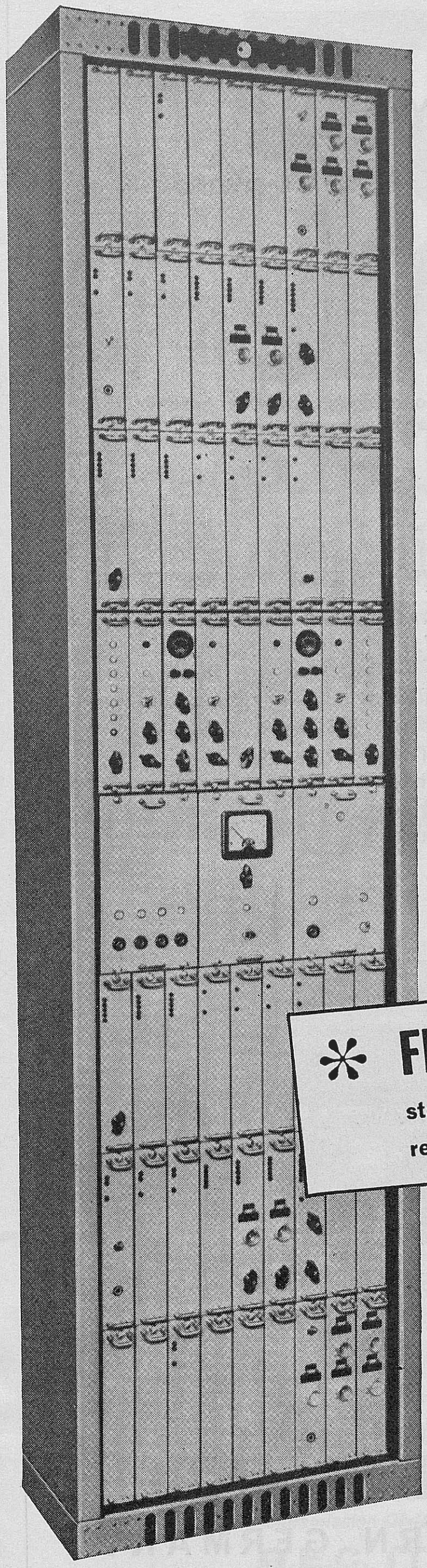
75% reduction in size

75% reduction in weight

90% reduction in power consumption

PLUS

Considerable savings in manpower, spares and maintenance



* One cabinet houses equipment for two 2-channel circuits which may be operated as one 4-channel circuit.
* Modular construction means greater reliability and greatly simplified maintenance.
* Built-in character storage for 4 or 8 character repetition cycle.
* Fully automatic phasing including rephasing in traffic with no loss or duplication of characters.
* Average rephasing time in traffic 4 seconds.
* Mis-routing of sub-channels is impossible even with sub-division on all channels.
* Error rate improvement factor of 100-10,000.

* **FERRITRANSISTORIZED** code converters and stores surpass fully transistorized designs by significant reduction in power and saving in space.

MARCONI

SOLID STATE **AUTOPLEX**

accurate ERROR CORRECTION
MULTIPLEX TELEGRAPH SYSTEMS

MARCONI'S WIRELESS TELEGRAPH COMPANY
LIMITED · CHELMSFORD · ESSEX · ENGLAND

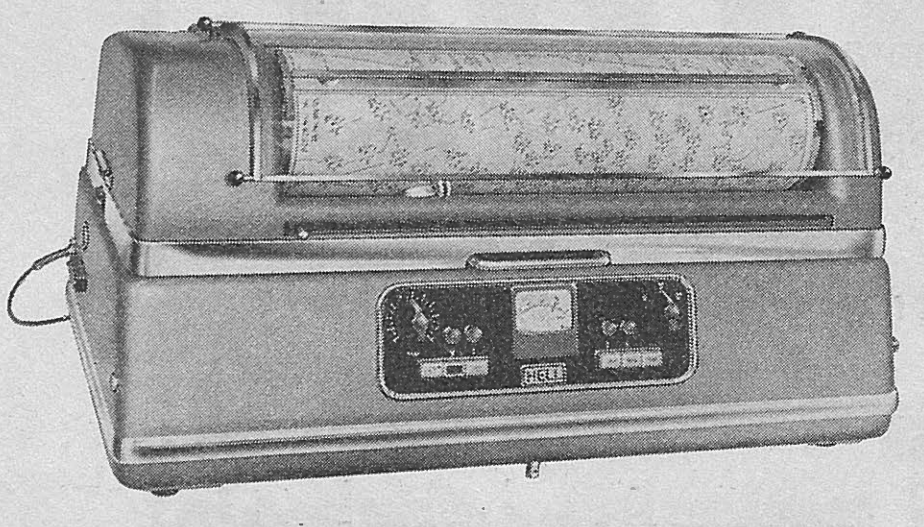
H7H

The world-wide Weather Service

with eight central points and many weather stations based all round the globe is being extended.
For the Meteorological Facsimile Service.

HELLFAX EQUIPMENT

which, because of its progressive techniques and sound construction has been for years in continuous use all over the world



HELLFAX WEATHER CHART TRANSMITTER

Type WF 204 for the transmission of weather charts in WMO Format 18″ × 22″. Equipped with automatic selection of correct module in Weather Chart Receiver and remote starting. Modules of 288 and 576 as well as rotation speeds of 60, 90 and 120 are selectable.

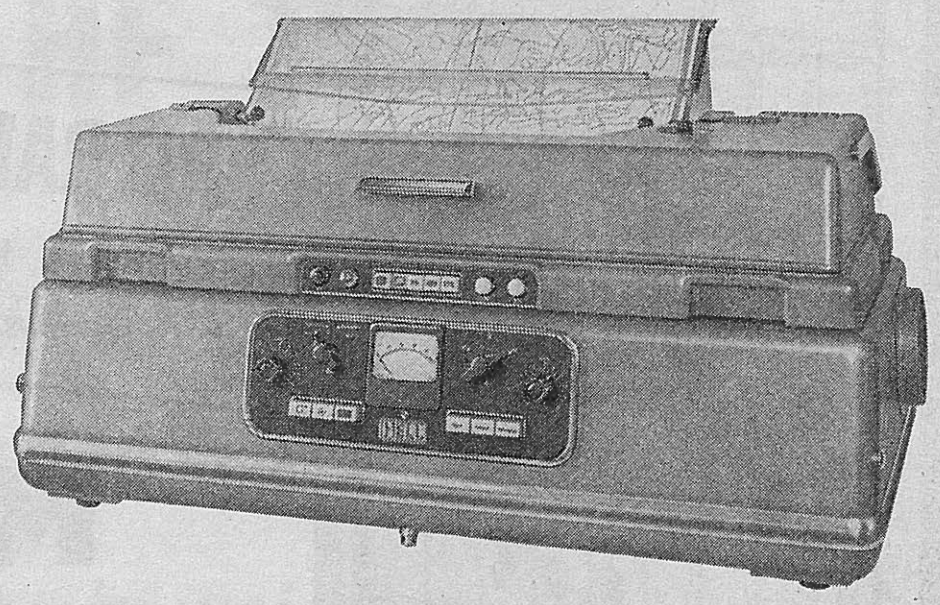
Type WF 204 T for Tandem operation. The built-in timing device ensures that any weather chart receiver(s) connected by radio or wire remains in synchronism during transmission pauses.

HELLFAX RECORDER

Type BS 110M for the recording of weather charts in WMO Format 18″ × 22″. With built-in device for remote control selection of Module 288 or 576 by selective calling frequencies.

Type BS 110MD with additional automatic selection by remote control of 60, 90 or 120 r.p.m.

Recording of weather charts is on ordinary unprepared rolls of white paper and operation is therefore extremely economical.



HELL

DR. ING. RUDOLF HELL

KIEL - WESTERN GERMANY

Telephone : 2011 **Telex : 02 92 858** **Cables : Hellgeraete**

1800
SPEECH CIRCUITS

or equivalent can be carried on

G.E.C.

SHF Broadband Radio Equipment

in the 5925–6425 Mc/s Band

Other microwave equipments available for

960 CIRCUITS

or TV plus sound in the 5925–6425 Mc/s band and

300 CIRCUITS

or TV in the 1700–2300 Mc/s band

Comprehensive range of ancillary equipment for protection channel switching, remote control and alarms, and narrow band service channels also available.

IN ADDITION G.E.C. ARE SPECIALISTS

IN COMPLETELY TRANSISTORED MULTIPLEX EQUIPMENTS

Transmission Division

G.E.C. (TELECOMMUNICATIONS) LIMITED

TELEPHONE WORKS · COVENTRY · ENGLAND *Works at Coventry and Middlesbrough*

Smees 121

A call from the north . . .

For the Commonwealth round-the-world telephone cable system L M Ericsson will supply the intercontinental switching centres at Montreal and Vancouver, which will link the Canadian National Network with the Atlantic and Pacific cables.

Designed on the L M Ericsson Crossbar System, these switching centres will connect calls between Canada, Europe and Australia. They represent a step forward in the world-wide automatization of the Commonwealth Communications Network, which will permit direct dialling between continents.

Telephone administrations throughout the world know the L M Ericsson Crossbar System. They know they can depend on improved, faster service for subscribers. They know they can cut operating and maintenance costs immediately and for years to come.

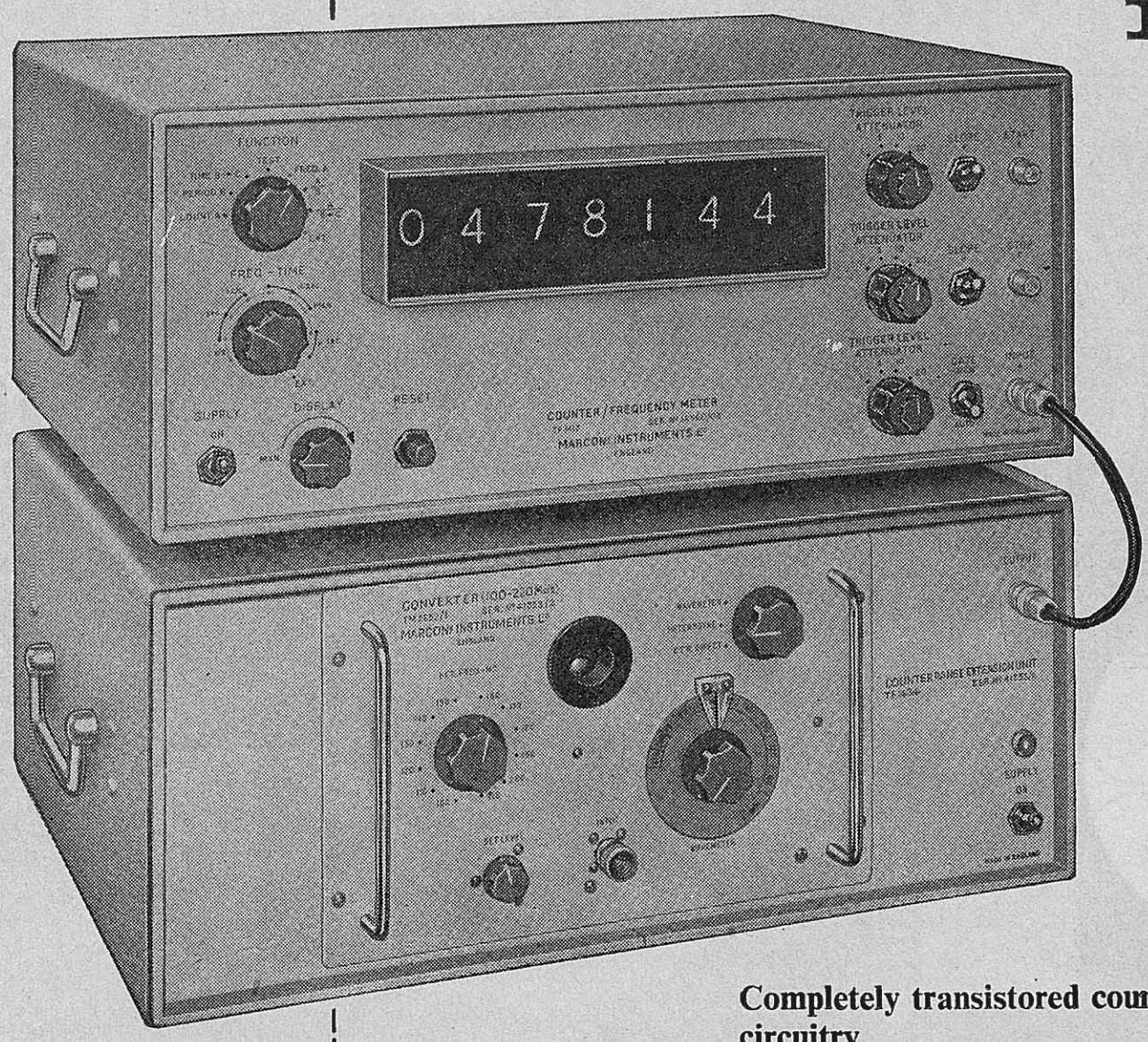
SYMBOL OF GOOD CONNECTIONS

A pioneer in telephony since 1876 . . . World-renowned for its telecommunications achievements . . . A global organization of more than 40,000 employees with manufacturing facilities in 12 countries and representation around the world . . . A leader in the development of automatic telephony and advanced telecommunications . . .
This is L M Ericsson, a name and an organization that means superior experience, skills and resources . . . A good connection for you too . . .

L M ERICSSON TELEPHONE COMPANY
STOCKHOLM 32 · SWEDEN

Ericsson LM

NEW | Compact 10 Mc/s COUNTER FREQUENCY meter



The type TF 1417 is a compact and versatile instrument for laboratory, industrial or systems applications.

Modular printed circuits and unit construction techniques are employed, ensuring reduced weight and small size. Dimensions: 7 in. × 17 in. × 14 in. Weight: 30 lb. Can be readily converted for rack mounting.

PLUS RANGE EXTENSION up to 220 Mc/s

Completely transistored counter circuitry

7 – decade in-line readout

Measures 0 to 10 Mc/s and time intervals down to 0.2 μsec.

Sensitivity: 0.25 volt

DC gating techniques allow remote function control

Time interval measurement against internal or external standards

Internal check of all decade dividers and counting units

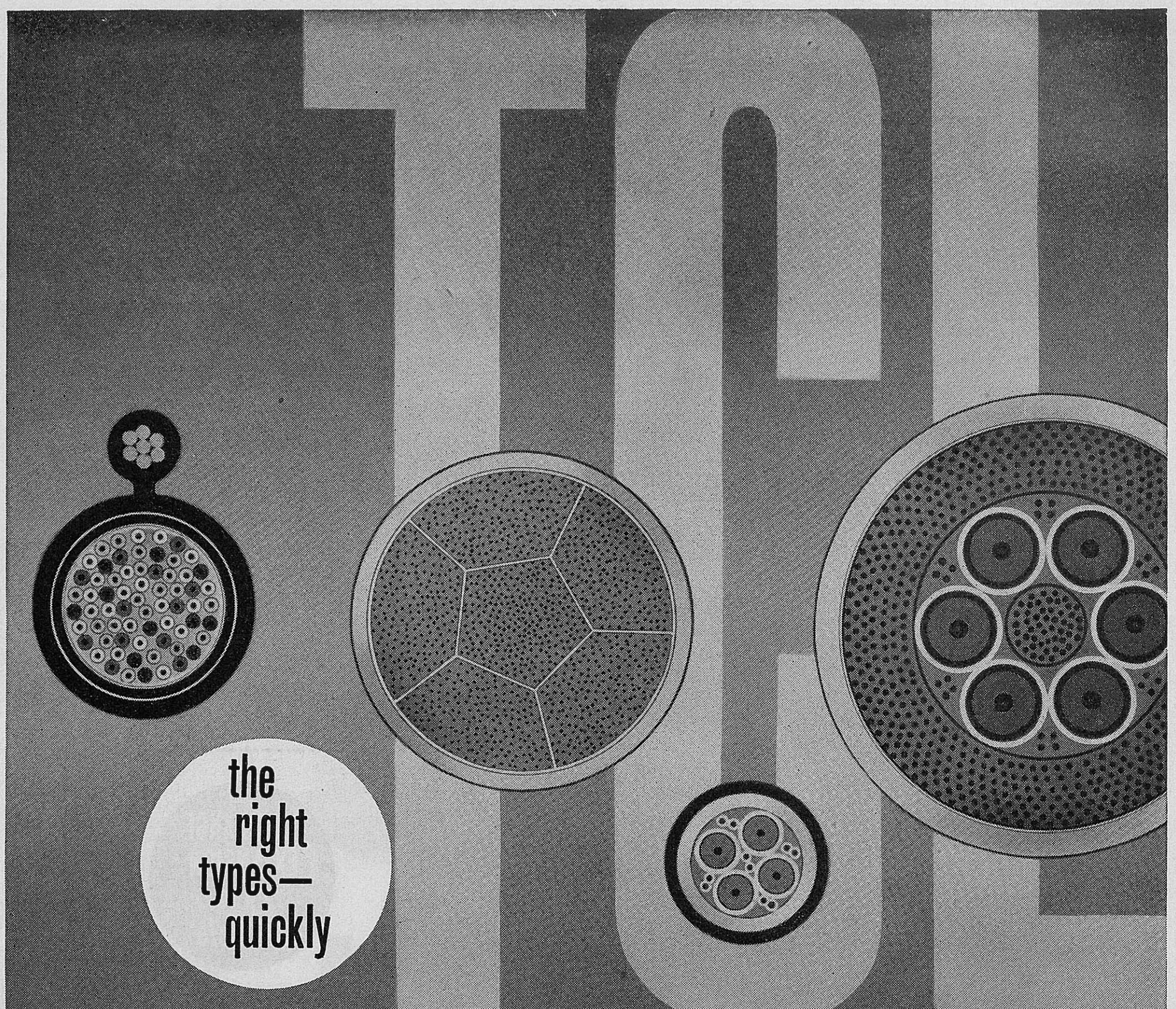
Auxiliary outlets for operation of digital printer or remote readout

MARCONI INSTRUMENTS

A good name for good measure

MARCONI INSTRUMENTS LIMITED
ST. ALBANS • HERTFORDSHIRE • ENGLAND

TC 201



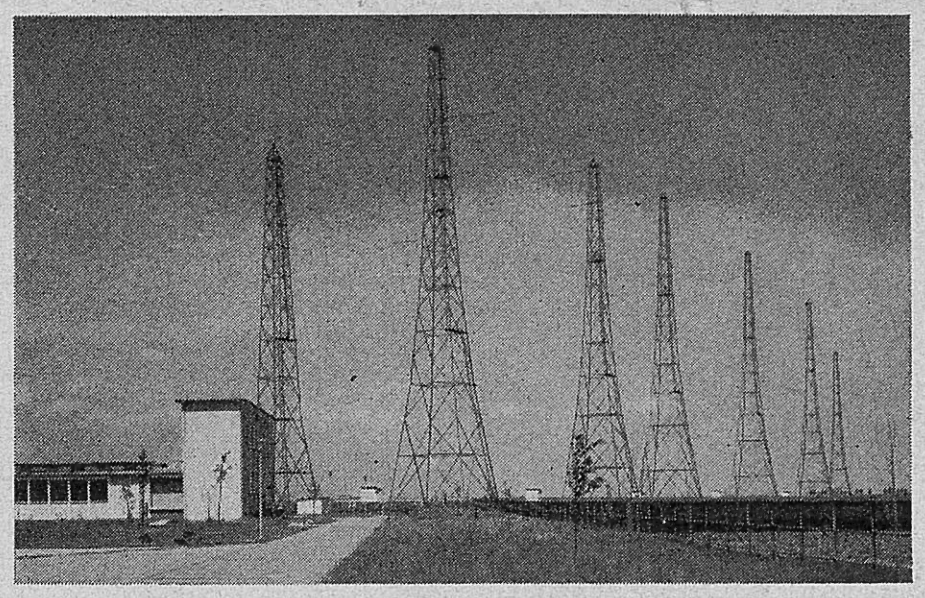
TELEPHONE CABLES LIMITED produce a wide variety

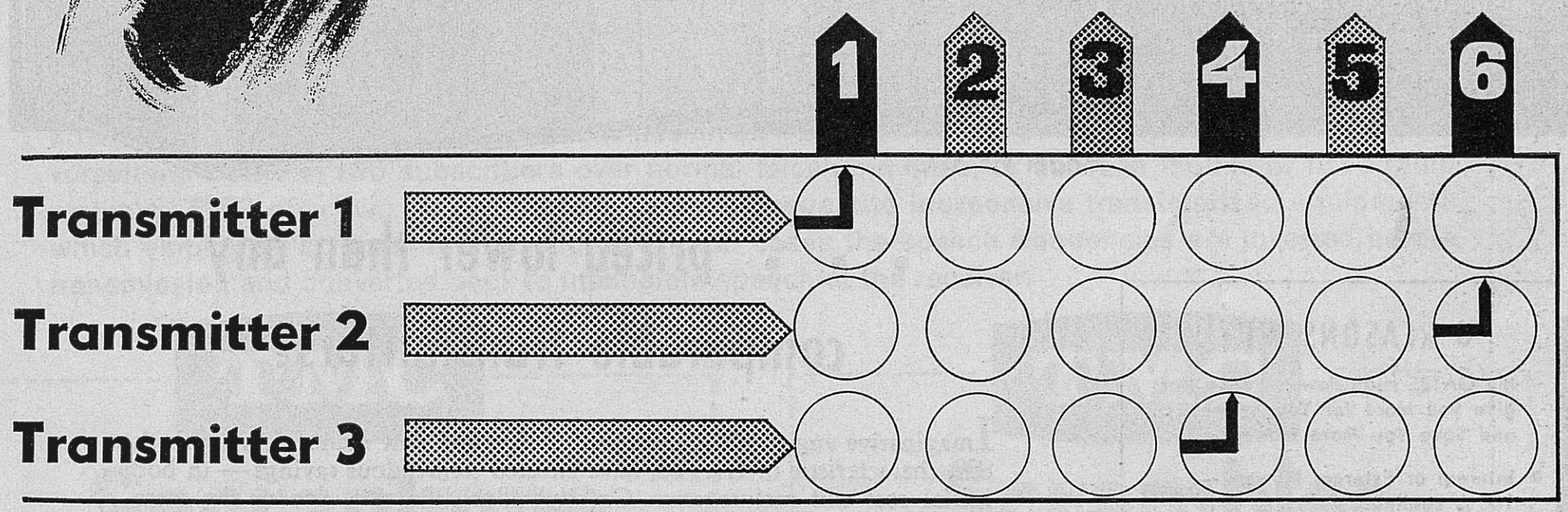
of telecommunication cables for country-wide telephone and telegraph systems, sound and television broadcast networks and control systems. TCL are also able to suggest immediately the types of cable that are best suited for any application . . . and supply them quickly. If a cable has to be made for special requirements, the immense manufacturing capacity of TCL ensures early delivery. TCL can design, manufacture and install the complete cable network, and through their associated companies can provide all the most modern equipment for telecommunication projects of any size or capacity.

TELEPHONE CABLES LIMITED, DAGENHAM, ENGLAND · TELEPHONE DOMINION 6611 · CABLES DRYCORE DAGENHAM

THE ORGANISATION WITH 125 YEARS' EXPERIENCE

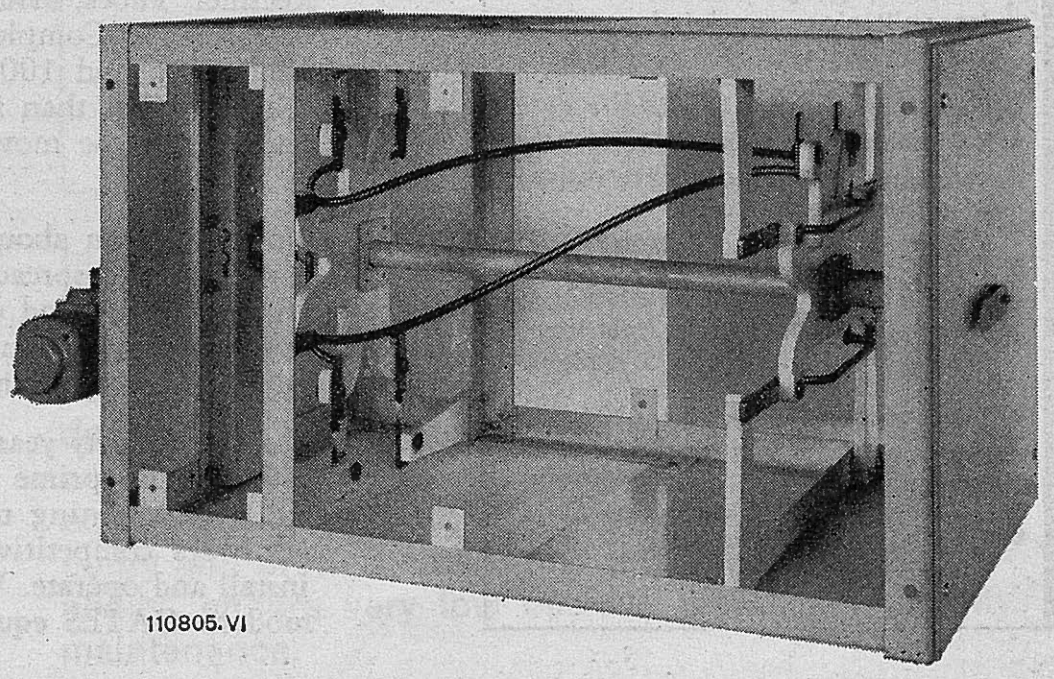
Cross-bar aerial selector





Any number of transmitters
Any number of aerials
Any desired switching scheme
Negligible cross-talk
Uniform characteristic impedance
Manual or remote control
Building-block design allows for easy assembly and extension

Power rating : 100... 500 kW carrier + 100 % modulation
Frequency range : 3... 30 Mc/s
Impedance : 300... 350 ohms, balanced



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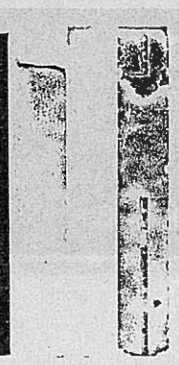


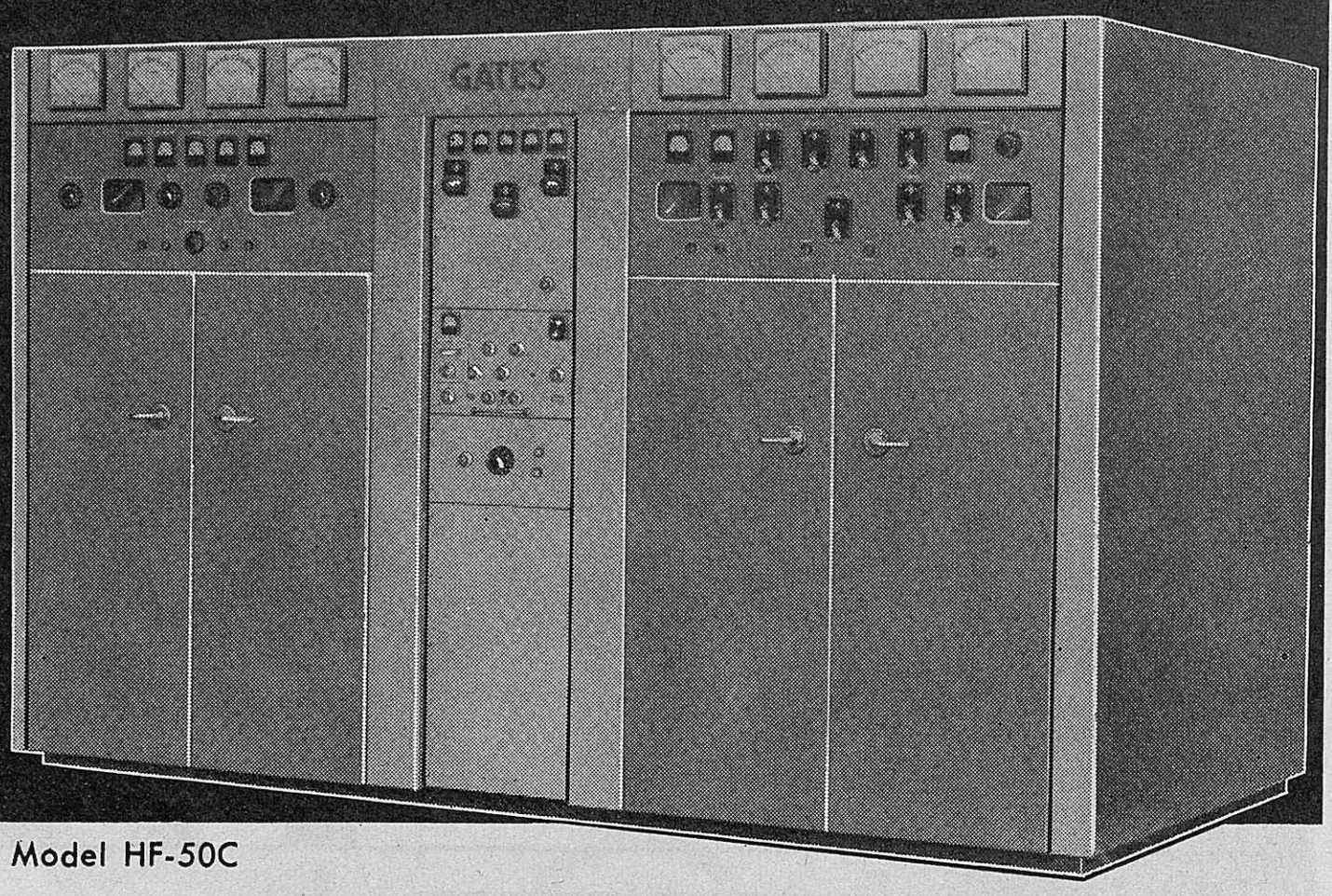
BROWN BOVERI

BROWN, BOVERI & CO., LTD., BADEN (SWITZERLAND)

Representatives in most countries

NOW! NEW HIGH POWER GATES TRANSMITTERS

A complete line of Short Wave and Medium Wave Transmitters including: 1 KW, 5 KW, 10 KW, 20 KW, 50 KW and 100 KW, especially designed to withstand the extremes of all world climates and the most rigorous demands of continuous duty. Every modern technical advance has been incorporated in the design of these superior transmitters. Compact size, rapid frequency change, interchangeability of PA and modulator tubes, longer tube life, and low power consumption.



Model HF-50C

6 REASONS WHY

the GATES High Power Transmitters give you More for Your Money . . . and Save You More Money!

- Internal or External Blowers — 100% cooling.
- Filament voltages for the entire transmitter are regulated, keeping filament voltage within ½% at all times.
- 14 meters are provided for convenient, continuous observation of all important circuits.
- Band Switching — a new concept of plate tank circuit design permits all adjustments to be made from the front panel in less than 5 mintues.
- Interchangeability of the 6804 power amplifier and modulator tubes, reduces spare tube inventory.
- Transmitter occupies ONLY 92½ square feet of floor space.

. . . priced lower than any comparable transmitters!

Imaginative engineering, improved design and new manufacturing methods, characteristic of GATES, have effected tremendous savings — in both initial cost and maintenance. Greatly reduced in size, due to the introduction of Silicon Dry Rectifiers replacing the old High and Low Voltage Rectifier Tubes, assuring almost unlimited life, rugged and dependable performance. Complete tuning is simple and rapid. No plug-in coils are used in 50 and 100 KW models and frequency change can be accomplished in less than five minutes. Many other unique features make these transmitters the most outstanding High Power units available anywhere at any price.

Now in use in about 75 countries around the world, these transmitters have won widespread acceptance and recognition thanks to their uniquely reliable service and economy. The long list of users includes major governments throughout the world, as well as international trans-oceanic radio communications and press services.

For nearly forty years, GATES has been a leader in electronic communications. The prime reason for GATES' popularity everywhere is that while maintaining the highest standard of quality, GATES' equipment is always competitively priced — and equally important — costs less to install and operate. Why not write today for descriptive literature on this modern GATES equipment?

GATES RADIO COMPANY

Exclusive International Representative

ROCKE INTERNATIONAL CORPORATION

13 East 40th Street, New York 16, New York, U.S.A. Cables ARLAB

TMC

keeps it under two hats

In commercial and industrial organisations, as well as in official establishments, occasions frequently arise when security of communication is essential. To eliminate the possibility of overhearing conversations between two subscribers over normal telephone lines, or between mobile or fixed radio stations, TMC offer two types of small, inconspicuous and inexpensive transistorised equipments which employ a "scrambling" technique. In both cases the speech frequencies are inverted before transmission and converted back to intelligible speech at the receiver.

TMC

Secraphone

SECURES PRIVACY OF TELEPHONE CONVERSATION BETWEEN SUBSCRIBERS

Two units make up the complete equipment. The "Secraphone" telephone instrument is of the latest design and is used in exactly the same manner as an ordinary telephone. It operates in conjunction with the Frequency Invertor Unit, which is housed in a small metal case conveniently stowed under a desk. This latest transistorised model is being supplied in quantity to the British Post Office.
Responsible executives often require to speak confidentially over the telephone and here the TMC Secraphone is the answer.

TMC

Scrambler

PREVENTS UNAUTHORISED LISTENING TO RADIOTELEPHONE MESSAGES

In normal radio telephone communication between fixed and mobile units the message being transmitted can be heard by unauthorised listeners where receivers cover the same waveband. The need for security devices is therefore all the more necessary, and this need is met by the TMC Scrambler Type S2P. The equipment is very compact and the transistor circuitry and printed circuit boards give increased reliability, ensure very low current drain and simplify maintenance.

TMC

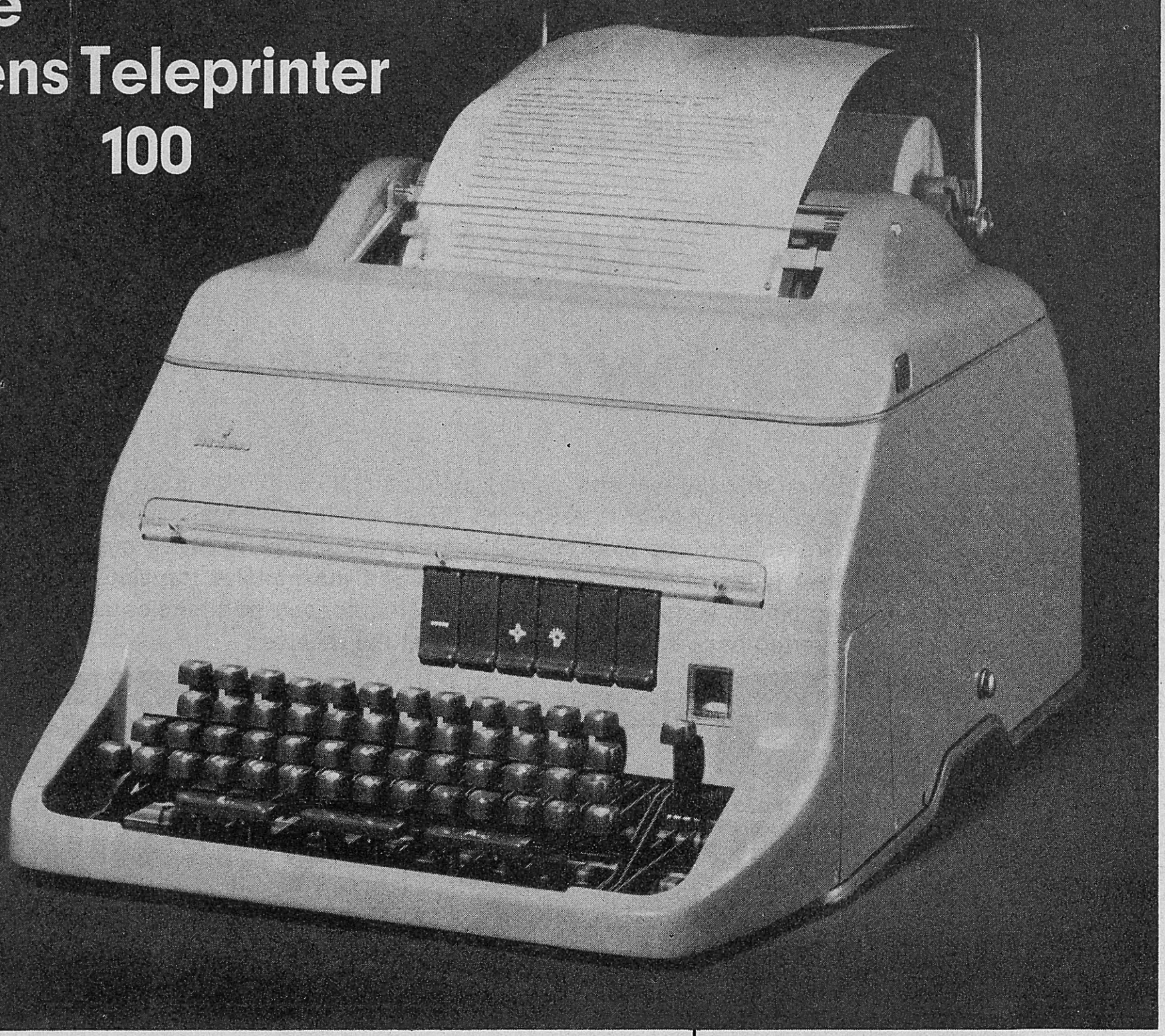
TELEPHONE MANUFACTURING COMPANY LIMITED
Dept. X, Transmission Division,
Sevenoaks Way · St. Mary Cray · Orpington · Kent · Telephone: Orpington 27020

A MEMBER OF THE PTE GROUP OF COMPANIES

B53T

SIEMENS

The Siemens Teleprinter 100



122-12-41

has, within the space of a few years, gained confidence all over the world.
In more than 70 countries, it proves its reliability day after day even under the most severe operating conditions.

Elegant styling, easy operation, and a clear design concept are the features on which the world prestige of the Siemens Teleprinter 100 is founded.

Cubage and ease of operation are the same as with an electric typewriter. Due to the stationary platen, the printed text does not move, not even during letters and figures shift. Number and legibility of copies are the same as on an electric typewriter. Line spacing is adjustable. The machine shows an extremely low operating noise level. Self-contained units, which are readily replaceable with a few manipulations, are provided for every function such as drive, transmission, reception, and printing. This renders maintenance operations easy and time-saving.

By means of several supplementary attachments, the application range of the Siemens Teleprinter 100 can be markedly expended.

**The Siemens Teleprinter –
a teleprinter
which is abreast of the
correspondence needs
of today's
business organizations.**

SIEMENS & HALSKE AKTIENGESELLSCHAFT
WERNERWERK FÜR TELEGRAFEN- UND SIGNALTECHNIK · MÜNCHEN

telecommunication journal

Journal télégraphique (1869-1933)
57 volumes published

Telecommunication Journal (since 1934)
Volume 29

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ITU ELECTRONIC COMPUTER

As from 1 July, the ITU became the first specialized agency of the United Nations to operate an electronic computer on its own premises.

The computer represents the latest stage in the modernization of the IFRB's work. For some years, the Board has been using a punch-card system as a mechanical aid in processing the flood of data arising out of the frequency notifications received from the Members of the Union. The system has also helped in the preparation of material for such ITU publications as the International Frequency List and the Summary of Monitoring Information.

The growing complexity of this work, together with the recent increases in the tasks entrusted to the Board, has demonstrated the need for a speedier and more versatile system. The computer will also make it possible for much of the International Frequency Registration Board's technical calculation work to be carried out mechanically.

The idea of using an electronic computer was first broached at the 1959 Plenipotentiary Conference which, in its Resolution No. 22, instructed the IFRB to study the possibilities and report on them to the Administrative Council, and authorized the Secretary-General to make the necessary budgetary provisions. The Council's 16th Session authorized the hiring of an IBM 1401 computer for an initial period of one year from 1 July 1962. This has now been extended by a further six months till the end of 1963.

During this period, it will be possible to see whether this latest mechanical aid fully measures up to the IFRB's requirements, which, with the Board's new duties in assisting new and developing countries, are constantly expanding.

N. H. R.

headquarters

DEPUTY SECRETARY-GENERAL'S MISSION IN ASIA

Dr. M. B. Sarwate, the Deputy Secretary-General, took advantage of his presence in India on home leave to undertake an important mission in Thailand and the Republic of China.

He arrived in Bangkok on 12 August, where, in accordance with the directions given by the 17th session of the Administrative Council, he held discussions with the authorities of the Economic Commission for Asia and the Far East (ECAFE) on the agreement between ECAFE and the ITU. After a day of consultations, in which various ECAFE amendments to the agreement were considered, a solution acceptable to both parties was reached and an agreed draft was prepared for further action.

Dr. Sarwate also met Thailand communication authorities to discuss their proposal for the establishment of a training school with the assistance of the United Nations Special Fund.

Moving on to the Republic of China, the Deputy Secretary-General visited the Training and Research Centre at Chiao Tung National University, a Special Fund project for which the ITU is the Executive Agency. Various subjects of interest to the Centre were discussed —among them the recruitment of experts, the training courses themselves and problems concerning equipment for the Centre.

The Training and Research Centre at Chiao Tung National University.

THREE ITU EXPERTS FOR CHINESE TRAINING CENTRE

At the beginning of September, Mr. G. Conrad Dalman and Mr. Henry S. McGaughan, both of them professors of electrical engineering at Cornell University, Ithaca, United States, flew to China after having spent several days at ITU headquarters. They were joined a few days later by Professor Dean N. Arden of the Massachusetts Institute of Technology (MIT). These experts have been selected by the ITU, in cooperation with the United Nations Special Fund, to provide post graduate courses in electronics, physics, telecommunication and the theory and practice of electronic computers at the Training and Research Centre for Telecommunication and Electronics of the National University of Chiao Tung.

The three professors spent a few days at ITU headquarters to familiarize themselves with the working methods of the ITU Department of Technical Cooperation and to establish close contact with the officers of that department. They have now taken up their posts at the Training and Research Centre in the establishment of which the Chinese Government is being assisted by the United Nations Special Fund, and by the ITU, acting as Executing Agency for the Special Fund.

The three experts, who have been appointed for one year, will establish courses in microwave electronics, communication theory, network theory and computer programming and operations. Since the project is to last for three years, their work will be continued initially by other visiting experts who will follow them during the next two years.

A most important feature of the project, however, will be the selection of suitable Chinese students who, after participating in the courses established by Professors Dalman, McGaughan and Arden, and by the other ITU experts who will follow them, will then carry on the work of the Training and Research Centre after the completion of this Special Fund project.

ITU TECHNICAL ADVISERS IN CYPRUS

The Department of Technical Examinations and Technical Assistance of the International Frequency Registration Board, usually referred to as IFRB Special Assistance, despatched two members of the IFRB's staff as technical advisers to Cyprus: Messrs. A. W. Boyle and R. Smith.

These two experts went in response to a request from the Government of Cyprus. They were called upon to advise on the interference which might occur if a television and VHF broadcasting station were to be set up close to existing maritime and aeronautical VHF equipment. The mission lasted from 23 August to 5 September.

international

SATELLITE COMMUNICATION BETWEEN NORTH AND SOUTH AMERICA

Plans for the first satellite communication experiment linking North and South America have been announced by the International Telephone and Telegraph Corporation (ITT). The initial tests will connect ITT's space station in Nutley, near New York City, with mobile ground equipment to be set up by ITT on the outskirts of Rio de Janeiro, Brazil. The National Aeronautics and Space Administration (NASA) will employ the Pan American communication bridge in its soon-to-be-launched Project Relay satellite.

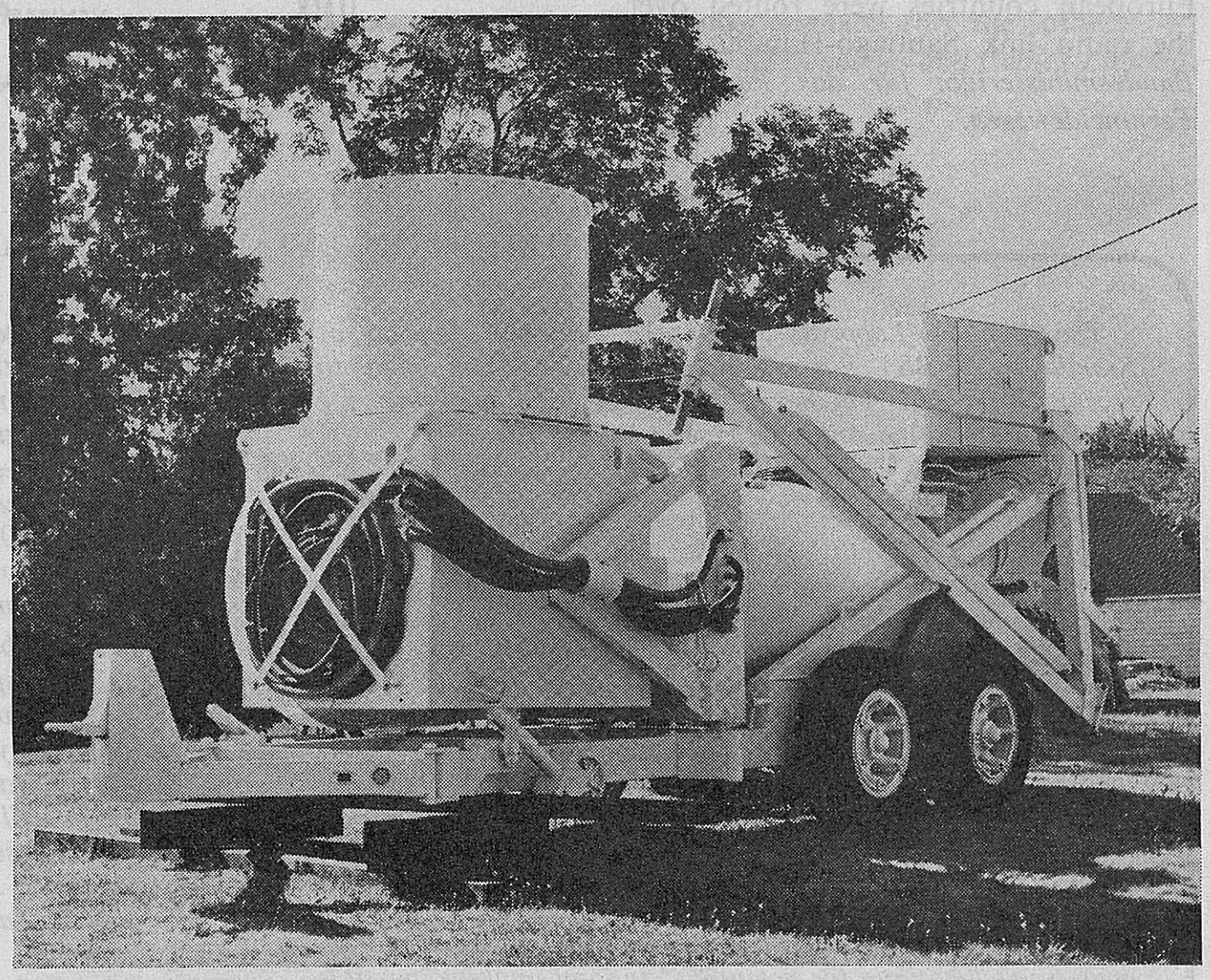
Direct communications via Relay also will be exchanged between the Rio station and the United Kingdom Post Office Department's ground terminal at Goonhilly Downs in Cornwall, England.

The transportable equipment which makes the Brazilian participation possible is a completely self-contained space communications ground terminal designed and engineered by ITT Federal Laboratories to provide telephone, teleprinter and high-speed data transmission capabilities.

The mobile station travels in a van and three trailers which can be shipped by sea, air, rail or road to any remote destination. Included in this packaging is a 9-metre " dish " antenna which can be dismantled into pie-shaped sections, and the antenna support tower which resembles an old-time locomotive when readied for shipment. In practice runs, four men have assembled the terminal in as little as 16 hours.

The Rio station, to be operated by *Companhia Radio Internacional do Brasil (Radional)* by authority of the Brazilian Administration in cooperation with NASA, has a capacity for 12 simultaneous two-way telephone conversations. The station can handle 12 simultaneous teleprinter or high-speed data circuits per voice channel, or 144 total circuits for these purposes when voice is not being transmitted.

The ITT at Nutley station employs a 12-metre " dish " antenna and support equipment housed in two igloo-type structures at the foot of the antenna tower. This complex includes a 10 kW transmitter power supply, tracking and communications receivers, antenna controls, monitoring consoles and control equipment that will combine all voice communications into one signal for ease in handling.—*ITT.*



The support tower and antenna-mount of the transportable space communications terminal, which resembles an old-time railway engine when retracted for shipment.

FOOTBALL AND TELECOMMUNICATIONS

On the occasion of the 7th World Football Championships in Chile, the *Deutsche Bundespost* placed additional communication links with Chile at the disposal of various press agencies as well as of broadcasting organizations by increasing the number of teleprinter channels on the existing radiotelegraph link Hamburg-Santiago de Chile.

Moreover, a photoradio line Santiago de Chile-Hamburg was established jointly with the radio company *Transradio Chilena*. Over this photoradio link 60 radiophotos were transmitted from Chile to the Federal Republic of Germany in the course of the championships.

The broadcasting requirements could, however, not so easily be met. To be in a position to transmit broadcasts of the sporting events in Chile for German listeners, the German broadcasting organization *Südwestfunk* had offered, on behalf of the *Arbeitsgemeinschaft der öffentlich-rechtlichen Rundfunkanstalten der Bundesrepublik Deutschland* (ARD), to place a modern 20 kW single sideband HF transmitter at the disposal of Transradio Chilena for the duration of the championships. Officials of the Deutsche Bundespost took part as advisers in the negotiations between the Südwestfunk and the Chilian radio company concerning the installation of the transmitter; later on these officials carried out the trial tests from Santiago and also controlled the technical operation during the transmissions of the sportscasts.

On the German side, the Deutsche Bundespost provided modern high-

performance fixed station radio receivers with the corresponding directional antennae at the overseas receiving station Lüchow as well as a 20 kW HF transmitter of the overseas transmitting station Elmshorn for an engineering circuit to Santiago de Chile. Rhombs of special dimensions were used in both countries as antennae for the HF transmitters. The rhomb used at the overseas transmitting station Elmshorn for the direction 241.5° has the following dimensions: height 30 m., long diagonal 248 m., short diagonal 82 m. For the receiving end, standard rhombs were used at the overseas receiving station Lüchow for the direction 245°, which had the following dimensions: height 20 m., long diagonal 180 m., short diagonal 69 m. The operating frequencies used for the transmissions were in the band 14 Mc/s-20 Mc/s.

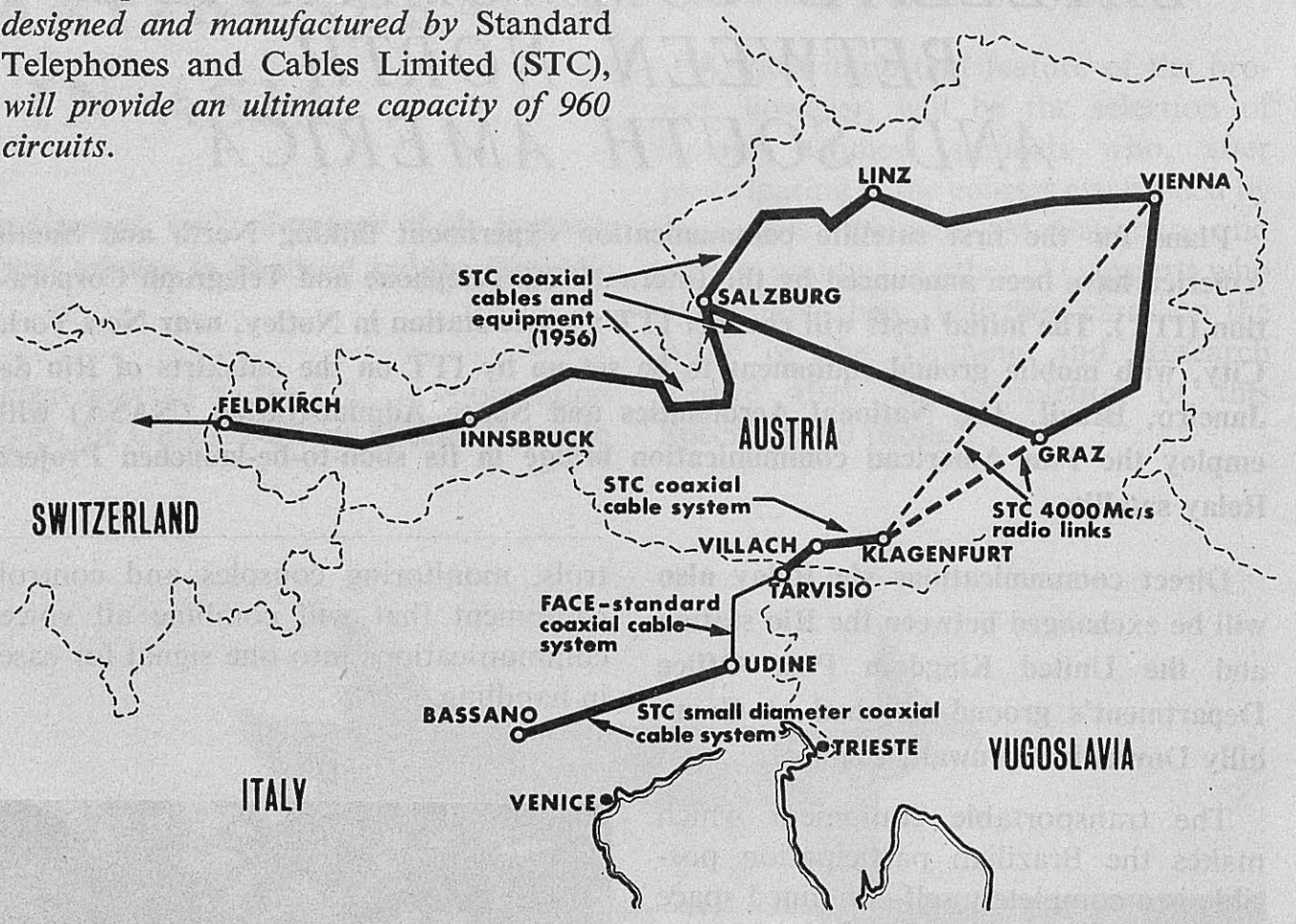
The German broadcasting organizations received 26 transmissions of a total duration of 25 hours, which they transmitted over their broadcasting stations. In addition, 12 transmissions for other European countries were routed over the radio link Santiago-Hamburg. — *Bundesministerium für das Post- und Fernmeldewesen.*

COAXIAL CABLE BETWEEN AUSTRIA AND ITALY

A coaxial cable system which will provide important new communication facilities between Austria and Italy has been inaugurated. Whereas the existing links between these two countries total 159 telephone circuits, the new system, designed and manufactured by Standard Telephones and Cables Limited (STC), *will provide an ultimate capacity of 960 circuits.*

The new cable system covers the 80 km between Klagenfurt in Southern Austria and Tarvisio in Northern Italy.

The new cable system is part of an overall communications link between



SCIENTISTS FOR ANTARCTIC RESEARCH

The Boulder Laboratories of the National Bureau of Standards (NBS) has opened its 1962-63 campaign to recruit electronic engineers and physicists to serve for 12-18 months in the Antarctic research programme.

NBS research projects in the Antarctic are a continuation of those which were begun during the International Geophysical Year (IGY), and will lead to the programme known as the International Year of the Quiet Sun (IQSY). Conducted in coordination with the National Science Foundation, the Boulder Laboratories' projects are concerned chiefly with the measurements of electromagnetic phenomena, with the characteristics and behaviour of the ionosphere, and with the effects of solar activities on radio transmissions.

The study of the electromagnetic geophysical phenomena of the polar regions is exciting and included are aurora, airglow, magnetism, very low frequency emission, riometry, micropulsations, radio noise, in addition to the ionosphere physics. In the Antarctic the land mass has provided permanent fixed locations for scientific stations, making possible the continuous study of the variables of nature without the complications caused by constantly changing position as in the case of Arctic stations located on the pack ice.

The Radio Noise Section operates a network of recording stations throughout the world to determine the level and character of the radio noise (static) with which wanted radio signals must compete. One of the most interesting stations in this network is the one located at Byrd Base, Antarctica. This station is in the unusual geographical location that allows study of the propagation of noise from thunderstorms along the equator over a night-time path. Also, since Byrd Base is located near the centreband of auroral activity, this is a unique location for the study of the effects of this phenomenon on radio noise and reception. The noise recording equipment is located about a mile from the base camp and is complete with its own diesel-electric generating equipment. The radio noise is recorded automatically on eight discrete frequencies from 51 kc/s to 20Mc/s. The recordings are made on two channels simultaneously and on a time sharing basis so that each frequency is sampled for fifteen minutes each hour.

The corpuscular bombardment effects of energetic particles on the earth's ionosphere will be observed in the Antarctic at the new Eights station and at Byrd station. Simultaneous observations of very low frequency emissions and whistlers, airglow and aurora, ionospheric absorption, and magnetic micropulsations will be made in a comprehensive geophysical experiment. This series of related experiments will make possible a detailed study of energetic particle behaviour as influenced by the earth's magnetic field, and the effect these particles have on the ionosphere. The experiments will permit a detailed study of the relationship between the occurrence of geophysical phenomena as observed simultaneously in the two hemispheres, since similar observations will also be made in the northern hemisphere.

One of the principal instruments to be used in these stations is a vertical incidence, sweep frequency, pulsed radar. Using this instrument, it is possible to determine certain characteristics of the upper atmosphere, including the heights and electron densities of the ionospheric layers. The data from each station are transmitted to the World Data Center in Boulder, where they are available to other research workers for analysis. — United States Department of Commerce.

Vienna and Bassano in Northern Italy, for which STC and its associate company, FACE-Standard *of Milano, were responsible. This overall link comprises five sections : the Vienna-Graz cable system ; the Graz-Klagenfurt 4000 Mc/s microwave radio link, now being modernized to carry 960 telephone circuits and 625-line television ; the Klagenfurt-Tarvisio, the Tarvisio-Udine cable systems and the Udine-Bassano small-diameter coaxial cable system.*

Another communication link now being supplied by STC to Austria is the 4000 Mc/s microwave radio system which will be brought into service later this year to carry multi-circuit telephony and television between Klagenfurt and Sonnwendstein, near Vienna. A 6 Mc/s cable system incorporating vestigial sideband equipment is to link Vienna television studios with the local transmitter at Kahlenburg. — Standard Telephones and Cables Limited.

administrations and operating companies

RADIO COMMUNICATIONS EQUIPMENT FOR PAKISTAN

Pakistan is to have further considerable installations of Marconi high-frequency radio communications equipment. The new equipments are to be installed at the Pakistan Posts and Telegraphs Department's stations at Pipri, Ghaggar, Karachi, Rawalpindi and Dacca.—*Marconi News.*

LOCAL AREA CARRIER IN LONDON

A substantial increase in the number of telephone circuits carried by existing and new cables between telephone exchanges should be possible using a new system of " carrier " telephony now on test in London and North Kent. Encouraging first results are reported by engineers working on the trials.

Equipment has been installed at Faraday Building, London ; at Crayford telephone exchange in Kent; and at nine points along this cable route, to test the performance of the system, designed and built by Standard Telephones and Cables Limited (STC). The tests, which have now completed their first six months, are being conducted by STC by arrangement with the General Post Office (GPO).

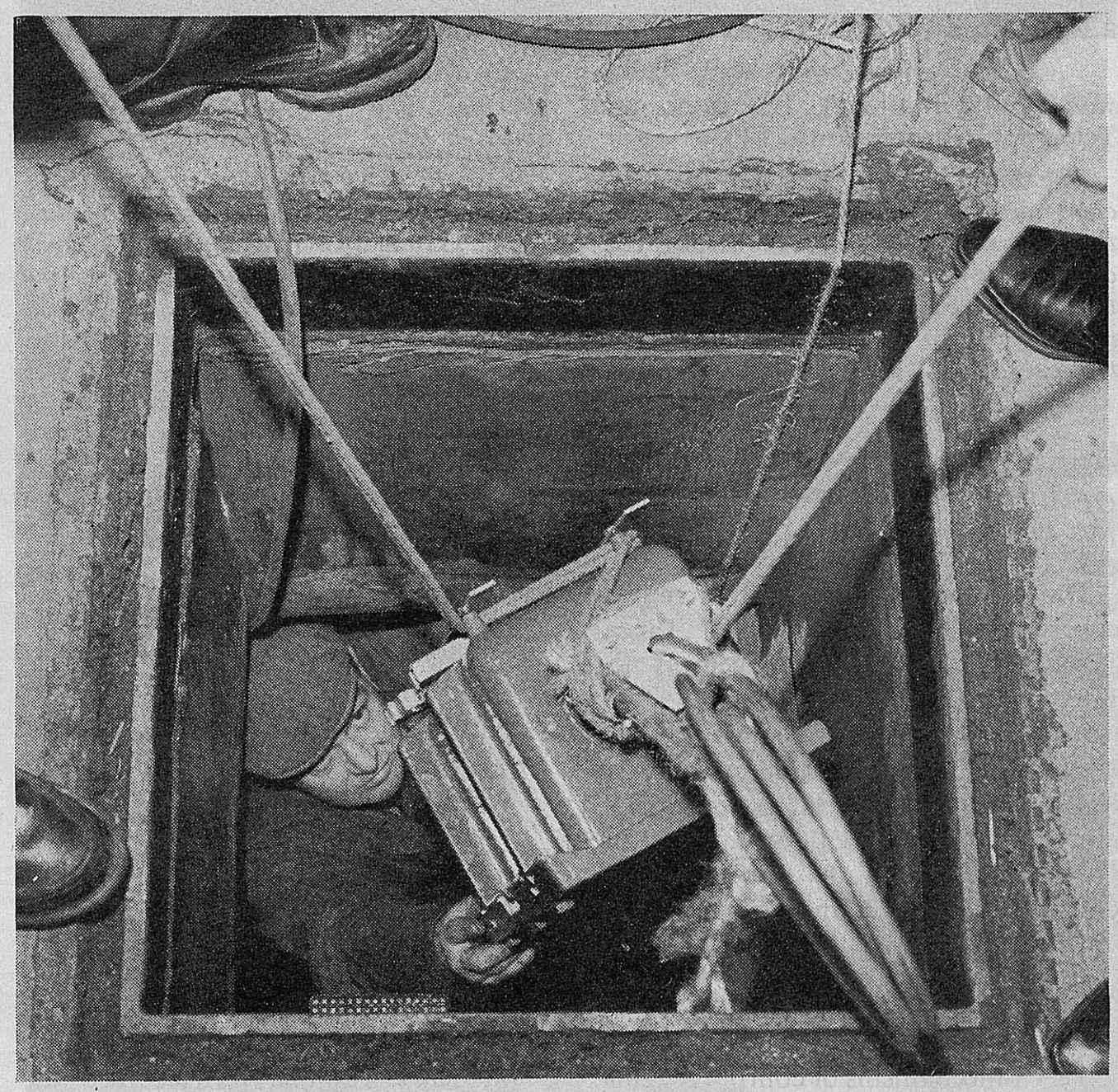
The new system could help to provide those extra lines between exchanges needed to cope with the growing use of the telephone. It will have no direct effect on the availability of lines between exchanges and individual subscribers.

The system is called " local area carrier " and is experimental at present. It uses techniques similar to those which have been used for the past thirty years on long-distance cables. Its adoption for shorter distances is basically a question of economics—whether it is cheaper to lay new voice-frequency cables or to install the carrier multiplexing equipment which makes it possible to pack many times the number of telephone circuits into existing cables.

The advent of new components and materials such as transistors and ferrites has greatly reduced the distance over which carrier working becomes economic.

STC are testing two systems over lines in the Faraday-Crayford cable, which passes through the telephone exchanges at Bermondsey, Tideway, Woolwich and Erith. There are nine repeaters (amplifiers), spaced approximately 3600 metres apart; five repeaters being fed with power over the cable from Crayford and four from Faraday Building.

Whereas each pair of wires in this voice-frequency junction cable is normally capable of carrying only one telephone circuit, in these tests two pairs are being made to carry twelve circuits. A thirteenth circuit passes the signalling (dialling) signals for the others. — *Standard Telephones and Cables Limited.*



A repeater (amplifier) is lowered into a manhole in Greenwich for the local area carrier telephone system trials. *(Photo: STC)*

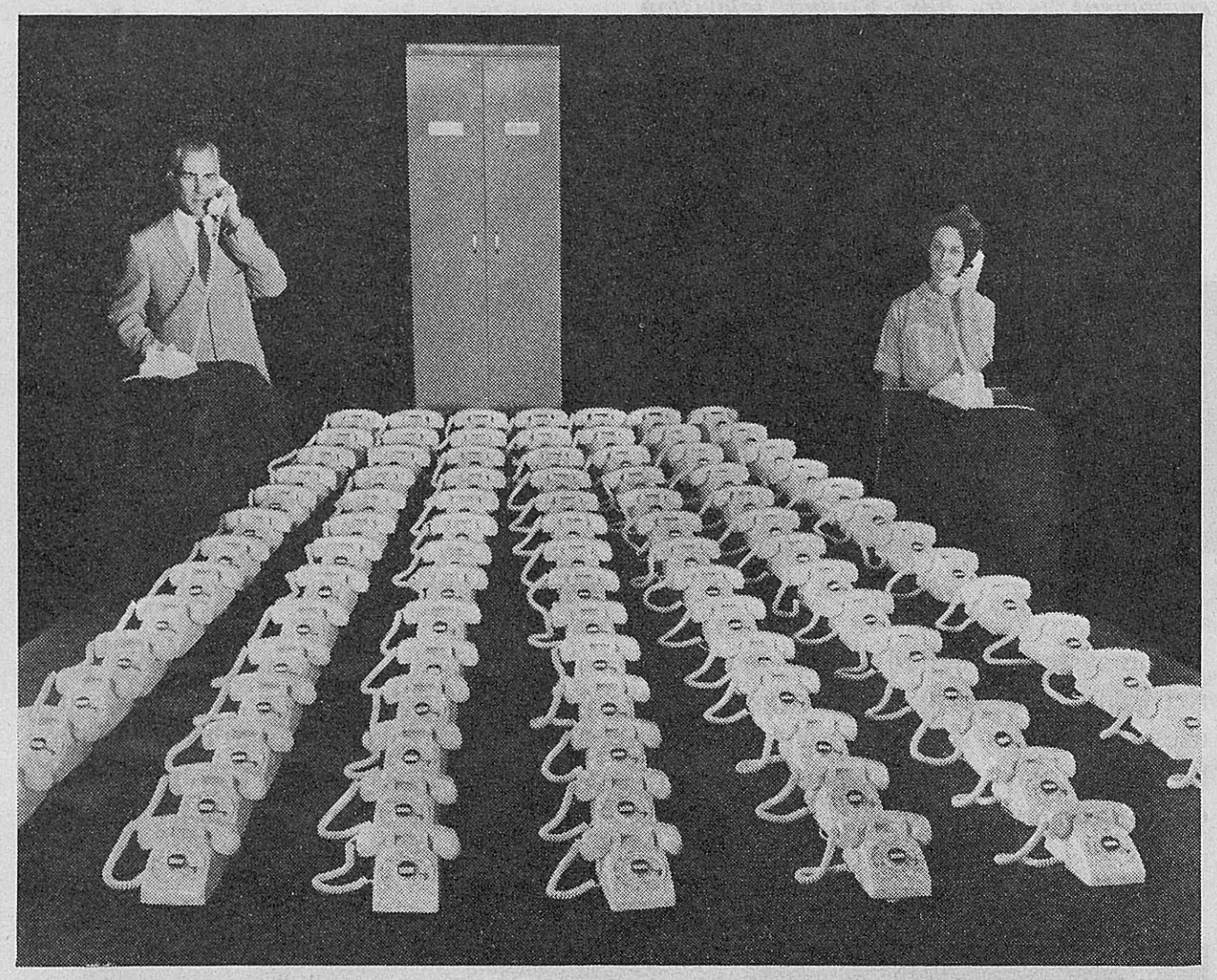
TRANSISTORIZED TELEPHONE SWITCHING SYSTEM

The Kelex 2000 system, the first economically feasible transistorized private automatic telephone switching system, has been produced by the Telecommunications Department of ITT Kellogg, a division of International Telephone and Telegraph Corporation (ITT).

The Kelex system provides fast, efficient and reliable dial telephone service through a new electronic switching concept. Using a random-selection principle, the switching network requires a minimum of control circuits and operates in microseconds.

The Kelex system is basically a space-division switchboard ; that is, a separate physical path for each simultaneous telephone conversation is provided. These connections are established by equipment common to the entire exchange and shared sequentially by the switchboard subscribers ; this is termed " time sharing." Thus, it can be described as a space-division switchboard with time-sharing common control.

Compact in size, the entire 100-line Kelex system switching unit is not much larger than an office filing cabinet, and weighs approximately 181 kg. — International Telephone and Telegraph Corporation.



COURSE ON "DYNAMICS OF LINEAR SYSTEMS" IN ARGENTINE

During the present year a regular course on the Dynamics of Linear Systems has been introduced at the Regional Faculty of Buenos Aires (Department of Electronics) of the National Technological University, the lecturer being Mr. H. Decanini, Engineer. This subject will form part of the programme of study for electronic engineers (with guidance in control).

It will be developed as follows:

Systems of dynamics (electrical, mechanical and electro-mechanical);

Servo-mechanisms of control systems;

Theory of discrete and continuous systems;

Analysis of problems of stability and methods of designing maximum efficiency systems in general;

Methods of analysis will include in particular the use of both analogical and digital computers. — *Argentine State Secretariat of Communications.*

PERSONNEL CHANGES...

... IN COLOMBIA

Mr. Telmo Muñoz Bolaños has been appointed Chief of the International Postal Department of the Ministry of Communications, replacing Mr. J. Augusto González Infante who has resigned.

. . . IN JAPAN

Mr. Sakae Teshima has succeeded Mr. Hisatune Sakomizu as Minister of Posts and Telecommunications.

Mr. Hidekazu Matsuda, Chief representative of Japan on the Administrative Council, has retired from his country's Ministry of Posts and Telecommunications to take up an appointment as auditor with the Nippon Telegraph and Telephone Public Corporation. Mr. Teruhiko Kashiwagi, also a Member of the delegation, has been promoted General Director of the Tokai Radio Regulatory Bureau (Nagoya District). Mr. Megumu Sato has succeeded Mr. Kashiwagi as Telecommunication Councillor.

. . . IN JORDAN

H.E. Fadl El-Dalqamoni has been appointed Under-Secretary to the Ministry of PTT, in replacement of H.E. Adel Khalidi, who has been transferred to the Ministry of Foreign Affairs.

... IN PERU

Mr. Julio César Nieri C. has been appointed Director-General of Posts and Telecommunications.

. . . IN THE REPUBLIC OF THE CONGO (LÉOPOLDVILLE)

Mr. Charles Kibonge has been appointed Director of the Telecommunication Service.

. . . IN RHODESIA AND NYASALAND

Lieut-Colonel C. R. Dickenson has been appointed as Postmaster General in succession to Mr. W. Davidson who has retired.

... IN SPAIN

Mr. José Garrido Moreno has been appointed a member of the Telecommunication National Council of Spain.

RETIREMENT OF MR. ACTON

Mr. Charles J. Acton, who achieved fame throughout the radio world as Chairman of the ITU's 1959 Geneva Radio Conference, has retired from his post as Superintendent of Radio Regulations and International Agreements in the Telecommunications and Electronics Branch of Canada's Department of Transport.

Mr. Acton, who first joined his government service in 1919 as a radio operator, was constantly active in international radio matters. He represented Canada for many years on the ITU's Administrative Council, and was elected its Chairman in 1954.

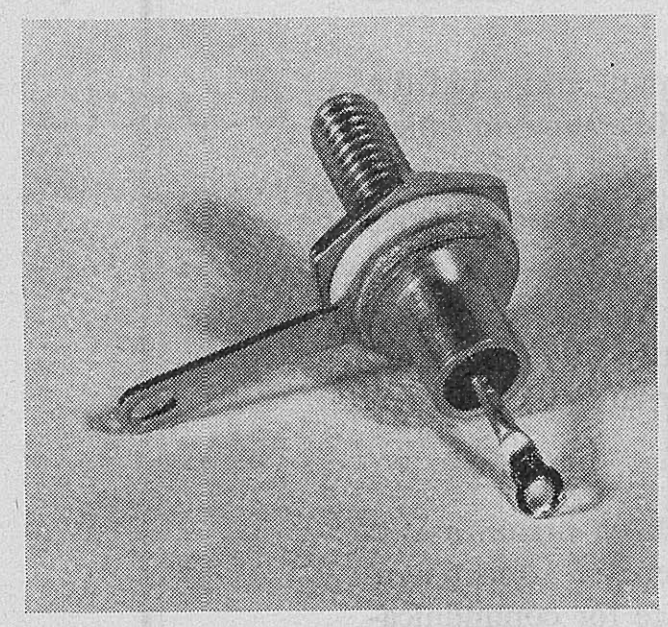
A fuller account of his long and distinguished career is to be found in the issue of the Journal for June 1961, when he was the Telepersonality of the month.

technical

INSULATED-BASE ZENER DIODES

A series of insulated-base zener diodes are manufactured by International Telephone and Telegraph Corporation (ITT) Components Division. The diodes are high-power voltage-regulating devices that bolt directly to heat dissipating surfaces, eliminating the usual mica or plastic insulating washers with their possibility of poor thermal contact and their danger of electrical leakage.

A 1.3 mm. thick ceramic insulating disc in the device withstands potentials in excess of 1000 volts and has high



The insulated-base zener diode.

thermal conductivity, assuring adequate transfer of the internal heat of the diode to the heat sink for dissipation. The base of the unit provides 30% more contact area than usual between the diode and heat sink, giving lower thermal resistance while still remaining within the outlines of the compact JEDEC DO-10 package.

The ratings of this ZN series of diodes are specified at 25 degrees centigrade case temperature measured on the flat on the mounting hex, not on the body of the device, for simplified heat-sink calculations. The dissipation ratings available are 1.5, 3.5 and 7.5 watts at voltages from 6.8 to 200 and with ± 5%, ± 10%, and ± 20%. — *International Telephone and Telegraph Corporation.*

RADAR LOCATES CABLE FAULTS BY LAND OR SEA

Equipment called the Pulse Echo Fault Locator, incorporating a new method of direct presentation of results on a cathode-ray tube, is said to locate faults in undersea cables quickly, easily and accurately. The British firm which manufactures the locator reports that the equipment can pinpoint the area of a fault within 80 yards in normal underwater conditions. It is being installed to maintain the Commonwealth round-the-world cable, and can also be used for land cables and for testing cable manufacture.

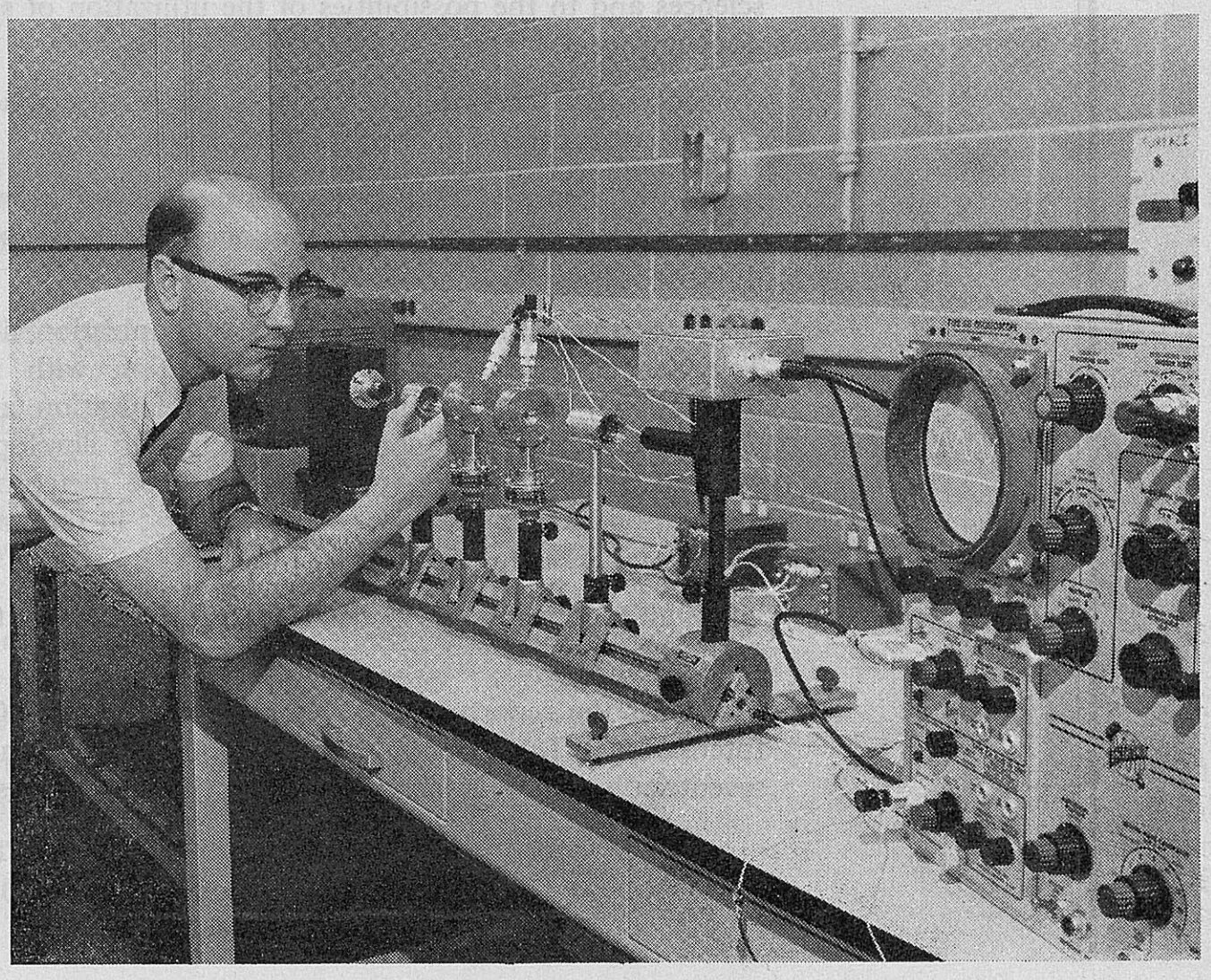
The locator sends a pulse or search signal along the cable at high speeds of the order of 100 000 miles a second. Any fault in the cable causes a "reflection" or "echo" back to the source of the pulse. A double-team cathode-ray tube displays the reflected pulse on the upper trace against crystal-controlled markers on the lower trace, which represent nautical miles of cable distance. The horizontal relationship of the two traces provides a direct reading of a cable distance against calibration graticule. — *Electrical Engineering.*

LASER MODULATION EXPERIMENT IN NEW YORK

General Telephone and Electronics Corporation has developed a new method for modulating the powerful light beams generated by laser devices designed for ultimate use in advanced communications. The new technique allows the lasers to be "tuned" rapidly for the first time like a conventional home radio set.

The new modulation method makes possible the design of a powerful and highly efficient laser communications system including transmitters and receivers with regulated and adjustable frequencies. Because of the tuning capability, the receivers could operate on the superheterodyne principle, which provides greater sensitivity by processing incoming signals at intermediate frequencies.

The ability to control and shift at will the inherently fixed frequency of a laser beam without modifying the device itself represents a significant advance that is expected to lead to a variety of new applications for the laser in ground and space communications, and other fields, the company said.—*General Telephone and Electronics Corporation.*



Mr. Carl F. Buhrer, who played a major role in the development, performs experiments with the laser modulation equipment.

ECOSOC AND SPACE TELECOMMUNICATIONS

At its summer session held in Geneva in July, the Economic and Social Council of the United Nations (ECOSOC) concerned itself with telecommunications within the framework of international co-operation in the peaceful uses of outer space. It had before it the special report prepared by the ITU in response to a request made by the United Nations General Assembly in its Resolution No. 1721 (XVI) of last December, the text of which was reproduced in our January, 1962, issue.

Ecosoc did not discuss the ITU report in detail, since it had yet to be examined by the United Nations Committee on the Peaceful Uses of Outer Space. It did however adopt an interesting resolution which we reproduce below and which relates both to the ITU report and to the report by the World Meteorological Organization (WMO).

"The Economic and Social Council,

Having considered the "First Report on the Advancement of Atmospheric Sciences and their Application in the Light of Developments in Outer Space", prepared by the World Meteorological Organization, in response to Part C of General Assembly resolution 1721 (XVI) of 20 December, 1961,

Noting that the report discloses the advances in the science of meteorology and its applications which would follow the development of a co-ordinated international meteorological satellite programme,

Having considered also the "First Report on Telecommunication and the Peaceful Uses of Outer Space" prepared by the International Telecommunication Union in response to Part D of General Assembly resolution 1721 (XVI),

Noting that recent developments have shown the substantial possibilities in this field through the use of orbiting space vehicles,

Noting that the Committee on the Peaceful Uses of Outer Space is scheduled to meet in the near future, to consider and make recommendations on the reports of the World Meteorological Organization and of the International Telecommunication Union,

1. Expresses its appreciation to the responsible organs of both organizations for their forward-looking approaches to the advancement of atmospheric sciences and to the possibilities of the utilization of space for communications purposes;

2. Considers that the various suggestions for further action contained in these reports merit careful and sympathetic study;

3. Notes with approval that both organizations will continue to consider and keep under close review future activities in their respective fields pertaining to outer space;

4. Requests the World Meteorological Organization and the International Telecommunication Union, in co-operation with the United Nations Educational, Scientific and Cultural Organization and the International Council of Scientific Unions, to take steps to develop and plan such educational and training programmes on space meteorological and telecommunication techniques as may be necessary, in response to Parts C and D of General Assembly resolution 1721 (XVI);

5. Urges all Member States to give all possible assistance to these organizations in these fields;

6. Transmits the reports of the World Meteorological Organization and the International Telecommunication Union to the General Assembly at its seventeenth session in accordance with the terms of resolution 1721 (XVI)."

(Ecosoc, Resolution No. 913)

SPACE COMMUNICATIONS

The Need and Scope for Action

by

GERALD C. GROSS

Secretary-General

SUMMARY

The author reviews briefly the history of space communications to date. He then describes the steps taken by the 1959 Radio Conference and by the Administrative Council of the ITU at its 17th session, as well as the action taken by the United Nations General Assembly in adopting Resolution No. 1721 (XVI) on 20 December 1961.

The great importance of the coming Space Communications Conference to be held in Geneva on 7 October 1963 and the probable necessity of enlarging the scope of its agenda from purely technical frequency allocation problems to include the concomitant economic, legal and operational aspects of space telecommunications is brought out.

The author then points out the tremendous future significance for all nations, particularly the new or developing ones, of space telecommunications as part of their national economy and social fabric.

He suggests the basic questions that need to be considered in the formulation of a plan for the world-wide operation of space communications. The technical and economic reasons, apart from efficiency, which make it essential for space communications to be operated in a single world-wide system are brought out and discussed.

He points out that unless the nations of the world can agree on a plan for a single rational system, providing unified operation on a global basis, it may be very difficult to obtain world-wide agreement on an international frequency allocation plan. The effects of failure to ensure interference-free space telecommunications would be disastrous.

The general situation

On 10 July 1962, with the launching of the Telstar satellite, space communications advanced into the full glare of public experimentation and operation.

On 7 October 1963, the nations of the world will meet in Geneva to discuss the future of space communications.

Thus, achievement in this fabulous new branch of technology—which is by its very nature of international concern—has already overtaken international preparedness for it. Nor is there the slightest doubt that, in the twelve months that remain until the convening of the Space Communications Conference, there will be a host of new developments in space telecommunication techniques.

In the whole history of the ITU there has never been a conference called to cope with a situation of such urgency. Reliable estimates show that, by 1980, the communication needs of the rapidly expanding world population will have exceeded the economic capability of transoceanic cables and the technical capability of the high frequency part of the radio spectrum. This situation is well understood by the larger nations which are pressing ahead with communication satellite systems with breath-taking speed. Therefore rapid international action is clearly essential.

And yet, so far, such speed has been largely confined to technical considerations and within national frontiers. It is only slowly, and almost reluctantly, that the international community seems to be awakening to the fact that the present headlong race into space is going to present it with a problem of hitherto unsurpassed magnitude unless some sort of concerted action is taken. True, there have been many professions of good-will, spiced by semi-visionary tales of a rosy future in which the human race will get off to a new start by uniting in the conquest of space. Such professions of good-will are no doubt sincere, but merely talking about the desire for cooperation is quite inadequate. Action is what is needed.

The decision by the majority of the Member countries of the ITU, on a proposal by the Administrative Council, to convene the Space Communications Conference in 1963 was a laudable and necessary start. But it is only a start. The rate at which technical advances in the space field are occuring, and will continue to occur, makes it imperative for the whole international community that the Conference should be successful. For it to be successful, long, careful and detailed preparation is necessary. It is here, I must in all honesty confess, that my anxieties begin.

Let me make myself clear. I do not doubt that several Administrations —particularly in those countries actively interested in space developments— are making, and will continue to make, full and painstaking preparations of a technical nature. I am equally sure that the vast majority of all other Administrations (and here I refer particularly to countries for whom space communication is far in the future) would like to do the same if only they could see exactly how or why their interests are involved in an enterprise which at this time may appear to them to be a monopoly of a few countries.

What I am setting forth here are my own personal views. On the other hand, the position of Secretary-General enables the incumbent to get a glimpse of many sides of the complex international picture, and a great part of his value as an international civil servant responsible to Member Administrations resides in that fact. By being forced to concentrate on international values, he is enabled to form an overall and impartial view which can often be helpful to national Administrations. I believe strongly in this aspect of the Secretary-General's functions, and I also believe that the position obliges him to present the views arising from his international experience if he considers that it would be useful to Members of the Union for him to do so.

It is in this spirit that I venture to utter a note of warning and to put forward my ideas on the Union's approach to the questions which most urgently need to be dealt with by the 1963 Conference. I write out of the conviction that the Conference is so important that if, for lack of a sufficiently comprehensive and far-sighted approach, it were to become stalemated or sidetracked, considerable, perhaps permanent, damage would be done to the interests of the international community and the nations which comprise it.

International action so far

A useful starting-point in an appreciation of the attitude to be adopted at the 1963 Conference is the action so far taken by the international community in space matters.

Official ITU interest in outer space goes back to the work of the CCIR in 1958. Then in 1959, the Geneva Radio Conference, among other things, took certain decisions regarding the recognition of space services and the allocation of frequency bands for space research and radio astronomy. However, the events most directly relevant to our purposes are of more recent date.

First in chronological order was the famous Resolution 1721 (XVI) adopted by the United Nations General Assembly on 20 December 1961 which welcomed the plans for the 1963 Conference and which, in words of considerable significance and import, recommended that the ITU "*consider at this conference those aspects of space communication in which international co-operation will be required.*"

We come next to the 17th session of the Administrative Council held last May and June, which proposed the convening of a conference on 7 October 1963, together with a provisional agenda which will be reviewed at its 18th session.

Now this agenda is almost exclusively concerned with questions of radio frequency allocation for space purposes, and it was no doubt for this reason that the Council subsequently adopted Resolution No. 496, a document of such importance that I will quote the operative part in full:

" *instructs the Secretary-General :*

1. to send an invitation to all Members and Associate Members of the Union so that they who so wish may, by 31 December 1962 if possible, submit information on:

1.1 technical progress and developments in space telecommunications;

1.2 subjects which they regard as appropriate for international cooperation in order to achieve the objectives set forth in General Assembly Resolution 1721 (XVI) Part D;

1.3 which of those subjects, if any, should be included on the agenda of the proposed 1963 Extraordinary Administrative Radio Conference;

2. in consultation with the I.F.R.B. and the Directors of the International Radio and International Telegraph and Telephone Consultative Committees, to prepare a report on these questions for the 1963 annual session of the Council;

requests all Administrations :

including those which, for the time being, may not have a direct interest in the development of space telecommunication techniques, to prepare themselves for an active participation in the 1963 Extraordinary Administrative Radio Conference so that this Conference may be in a position, as the case may be, to take all decisions within its competence which may have an influence on the future development of space telecommunications for the benefit of all the people of the world."

As I have already indicated, the provisional agenda for the 1963 Conference at this stage is almost entirely concerned with frequency band allocation and the possible revision of relevant Radio Regulations. The Council presumably felt that it was not in a position to propose anything further for the time being. At the same time, in view of the rapid advances of space technology and of the United Nations' expressed wish that the ITU also concern itself with the wider aspects of space communications, the Council decided to encourage Administrations to propose extension of the agenda by the adoption of Resolution No. 496. The need for such a resolution has already been amply justified by the success of Telstar. It is now up to all Administrations to respond to this challenging and timely initiative.

In approaching the 1963 Conference, there are perhaps four main areas on which preparatory thinking and work should concentrate:

(1) primary uses of telecommunication for space purposes;
(2) allocation of frequencies for space services;
(3) standardization of space telecommunication equipment;
(4) operation of space satellites for telecommunication relays.

Primary uses of telecommunication for space purposes

Before the Conference can proceed to take specific decisions of any kind, it should, I think, have a clear idea of the primary uses which should be made of space telecommunication techniques. I say this because I remember clearly the haphazard way in which uses of radio generally developed with all the ensuing confusion and difficulties in the allocation of frequencies. If this were to happen in outer space, the situation would be even more chaotic and damaging.

In making any appreciation of the most desirable uses of space telecommunication techniques, we must, I think, be guided primarily by technical considerations. For example, I believe that the Conference should first concentrate on meeting telecommunication requirements which cannot be met by purely earthbound systems such as local overhead lines, underground and submarine cables and radio relay links. It should be remembered that, however much telecommunication develops through and with artificial satellites, the limits of the frequency spectrum will continue to make it difficult to meet all new communication requirements, even when perfection of light-frequency transmission methods is achieved.

Allocation of frequencies for space services

Once the Conference has come to a clear idea of what are considered to be the primary uses of telecommunications in space, it will, I feel, be in a better position to tackle the hard core of its work—the frequency allocation problem. The allocation of frequency bands for space can of course only be made on the basis of estimated needs, and this is a complicated matter since there are different kinds of services which will have to be catered for—telecommand, tracking, telemetry and communication circuits, each with their own technical requirements. At the same time, if one regards the space services as a whole, it is clear that all the radiocommunication media are interdependent so far as the frequencies to be used are concerned. It is thus essential, in my view, to include in the estimates of needs all the uses that are going to be made of outer space in the next ten years at least.

One might provisionally classify those uses under three headings:

Category A—Satellites which may be described as "functional" and which will be used in the immediate future for telecommunications, meteorology and navigation;

Category B—Exploration and research that has been declared or is at least widely known;

Category C—Exploration and research that has not been declared as such.

It is quite clear that the frequency requirements for Category C uses are at least as large as those for Category B uses and certainly much larger than those of Category A. Moreover, since Category B uses vary considerably as regards the choice of frequency from those of Category A, and since it is essential that the latter must have frequencies that are well protected against harmful interference, I believe that it is in the interest of the harmonious operation of all services in space that three different categories of frequency bands should be allocated corresponding to the categories of uses listed above. I am aware that this is a very difficult matter, but I believe that the approach I have indicated is the one most likely to provide satisfactory results in the long run.

Returning to Category A (satellites for telecommunications, meteorology and navigation), practical frequency usage conditions will probably call for internationally-agreed assignment and operational plans, and a procedure for international monitoring of the assignments made. I do not believe that all of these plans could be prepared as early as 1963 or 1964. But I think that the Conference could very usefully discuss this problem and adopt some decision defining the ITU's position and guiding its future activities in the matter.

Standardization of equipment

It is already a major task of the ITU, through its International Consultative Committees—the CCIR and the CCITT—, to work for the standardization of the technical characteristics of telecommunication equipment, primarily with the aim of facilitating interconnection of all national telecommunication systems to form a world network. Standardization is even more necessary in

space telecommunications, since they are by their nature world-wide and since the new transmission media they will provide—whether telephony, telegraphy, television or data transmission—will have to be integrated into the existing international telecommunication network. Indeed, it would be very difficult to make space communications available to the nations of the world " on a global and non-discriminatory basis ", to use the words of United Nations General Assembly Resolution 1721, unless the equipment to be used were adequately standardized.

This problem may be thought to be beyond the scope of the 1963 Conference, and yet there is no doubt that it needs to be tackled quickly. While it is of course very difficult to prevent the manufacture of equipment based on different and sometimes incompatible standards, steps could be taken to reduce the harmful effects. Here again the Conference could easily discuss the problem and issue recommendations drawing attention to the standardization work programme of the CCIs.

It is worth recalling that the ITU once intervened successfully in conditions which seemed at the time to be just as delicate as the present ones. That was in 1906, when a Radiotelegraph Conference was convened in Berlin, essentially for the purpose of organizing and imposing the obligation of intercommunication in the maritime mobile service—an obligation that remains to this day in Article 46 of the International Telecommunication Convention. While the technical problem as regards space telecommunication is not the same, certain minimum obligations could still be established, granted the same spirit of solidarity and mutual appreciation of common interests that prevailed in 1906.

Operation of space satellites for telecommunication relays

In discussing the approach to the 1963 Conference, I have so far been speaking mainly of problems common to all manifestations of telecommunications in space. I come now to one particular aspect of space telecommunications, that is to say, the operation of satellites for purposes of telecommunication around the world.

This type of communication represents one of the first, and probably most effective practical uses of outer space, as the importance given to it in United Nations Resolution 1721 shows. Eloquent demonstration of the need for it is provided by the growing congestion of conventional means for long-distance communication. Vast sums of money are already being poured into it. And, since 10 July 1962, it is here with us.

The problem created by the tremendous developments of space communication is perhaps the most urgent confronting those of us who are connected in any way with outer space activities. That problem can be simply stated: *while space communications are a matter of international concern, there is as yet no adequate international machinery for dealing with them.*

Let me develop the two parts of this proposition. First, " space communications are a matter of international concern ". This remark has three implications. In the first place, it is a matter of fact that space communications only make sense if they are used for long range, particularly international, telecommunication and that already from the outset they are being so used. Second, it is without question that they should be used, as United Nations Resolution 1721 states, *for the benefit of all nations*—that is to say, in this context, the word " international " should be understood to mean " global ". Third, the possibility now facing us of two or more separate communication satellite systems, with all the duplication, inconveniences and dangers that this implies, makes the whole question of active concern to the international community.

The second half of the proposition is that " there is as yet no adequate international machinery for dealing with them ". I am aware, of course, that certain bilateral or multilateral negotiations are under way for the operation of communication satellites by two or more countries in common. However, such arrangements are certainly not truly international in the global sense

mentioned above. Moreover, they might naturally tend to encourage the operation of separate satellite systems.

I should like to dwell a moment on this question of separate systems. I have heard the view that communication satellites can and should be developed like earlier telecommunication media, particularly long-distance submarine cables, through bilateral or multilateral agreements. It is argued that in this way they can be more easily integrated, technically and economically speaking, with existing telecommunication media.

This could only be true if space communications were technically and economically comparable with terrestrial media. I do not think that this is the case. For example, microwave transmissions from satellites travelling at a distance of 300 or 30 000 kilometres from the earth would not be feasible without the agreement of all countries. In the first place, they would need to be made on frequencies whose assignment had been internationally recognized, and, second, all countries would have had to agree on action to prevent accidental interference which might occur on those frequencies and which could, in some cases, prove disastrous. There is also the economic angle. To be profitable, a space communication system must have a high capacity, which must be utilized, and this can only be done if the system is available to a large number of countries. Costs, too, would be less for each country in these circumstances.

These are a few of the compelling reasons why the world will inevitably, sooner or later, have to adopt a single universal space communication system instead of separate systems.

The 1963 Conference

But there are equally compelling reasons for it to do so " sooner " rather than " later "—that is to say, for the international community to legislate for a single system right from the beginning instead of waiting and attempting to convert multiple systems into one at a later date. And here, precisely, arises the urgency of the situation confronting the 1963 Conference to which I referred at the beginning of this paper.

In the first place, it is obviously far simpler technically and far cheaper economically to start out planning for one system than to embark on several and have to interconnect them later on. Second, in the intervening period, all the duplication, inconveniences and dangers inherent in separate systems to which I have referred will have had free rein. But the most important reason is that, if the nations of the world do not agree to plan for a single space communication system, it is unlikely that there will be any viable international space communication systems at all, at least for a very long time.

Why ? The answer is not technical, but diplomatic. To refer to United Nations Resolution 1721 once again, the international community made very clear its view that " communication by means of satellites should be available to the nations of the world as soon as practicable on a global and non-discriminatory basis." That means *all* the nations of the world. It includes that vast majority of nations which are still far from being able to participate actively in a space communication programme, but which, for obvious reasons of their economic development needs, are determined to be included in the plans for this tremendous new project from the earliest stages. To them, separate systems spell discrimination. Questions will arise in their minds. Will they be able to get in later ? On what conditions ? Are not separate communication satellite systems another barrier thrust between themselves and the nations more advanced in telecommunications ?

It is essential for the success of the 1963 Conference that all the countries attending it should work in a spirit of complete harmony and understanding and, specifically, that there should be no feeling on the part of the majority of countries which are at present less technically advanced that they might be left by the wayside so far as space communications are concerned. It is easy to see why.

For any kind of outer space activity, radio frequencies are needed and have to be allocated on an international basis. This, we have been told continually, is the real purpose of the 1963 Conference. But, for frequencies to be allocated for space activities, *many frequencies at present utilized by other radio services will have to be given up.* And it should be remembered that the controlling vote on whether the necessary frequencies should be transferred from present uses to outer space needs will rest with the majority of countries attending the Conference, most of whom are not at present directly engaged in space communications.

These countries will need to be convinced that they are making a wise investment, especially since this particular investment represents an initial sacrifice. They will only be convinced, I feel, by the assurance of full eventual partnership which a single communication satellite service alone can offer. If they are not convinced, and in consequence refuse to allocate the necessary frequencies, space telecommunications could be set back a decade. The main purpose of the Space Communications Conference will then have been destroyed.

It is for this reason that I am convinced that the world—in this case represented by the delegates to the 1963 Conference—must decide on the framework for a single world space communication system, and that the Conference itself must be prepared to face not only the technical, but also the important legal, economic and political problems involved.

The kind of international action required

One important thing to consider is the relationship between the national telecommunication organization in each country and the world picture.

In most countries of the world, telecommunication services are operated by the governments themselves. In some countries the national telecommunication organizations are privately-owned under government regulation.

Whatever the national system is, it must be integrated into the global system envisaged, which will require careful planning, not only technical, but also economic and operational. This planning can only be carried out at the international level.

Furthermore there is no doubt that, in any world satellite communication system, the technical operation of the vehicles would belong to the nations that launched and owned them, either individually or collectively. However, the exclusive responsibility of the international community would be to manage the satellite portion of an integrated global system.

The need for such international management is evident once the idea of a single international system is accepted. There remains only the question—what organization shall carry out this work?

It is obvious, in view of the tremendous technical and economic issues involved, that the people of the world cannot be satisfied with anything less than a United Nations agency. Here the international community has two possibilities before it.

It can create a new organization or it can use an existing one. Historically, we have the precedent of the International Committee for Air Navigation (CINA) being replaced by the International Civil Aviation Organization (ICAO) at the Chicago Conference in 1944. We also have the example of the creation in Vienna of a new organization—the International Atomic Energy Agency (IAEA)—which was brought into existence to meet the new and developing needs of the atomic age.

Alternatively, the world can decide to make use of the ITU which has grown with the needs of telecommunication over the last 97 years and, with a certain amount of streamlining and reorganization, would be in a position to take on the new duties and responsibilities involved.

It is in the hope that I might be of service to all who are preparing for the 1963 Conference that I have presented this paper. The future of human activities in space is too important to the world as a whole to allow of personal, sectional, national, regional or bloc interests.

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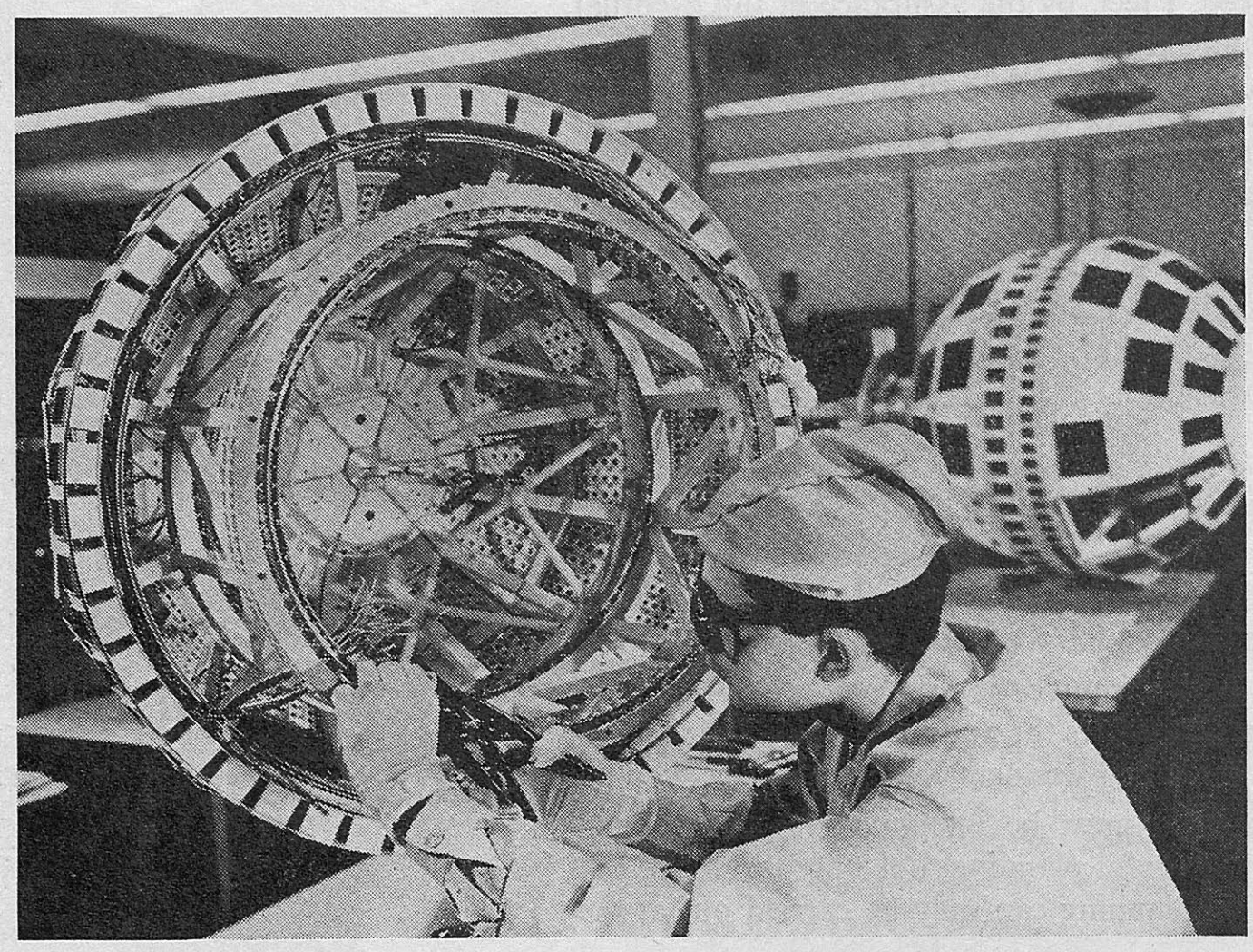
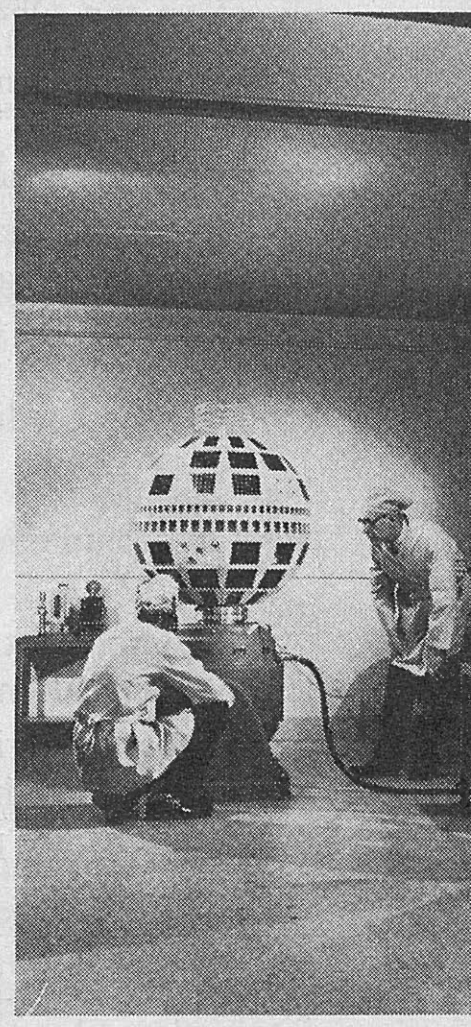


Technician is preparing ends of cable wires. In background, the framework of another Telstar satellite can be seen.



Testing the satellite at the Bell T
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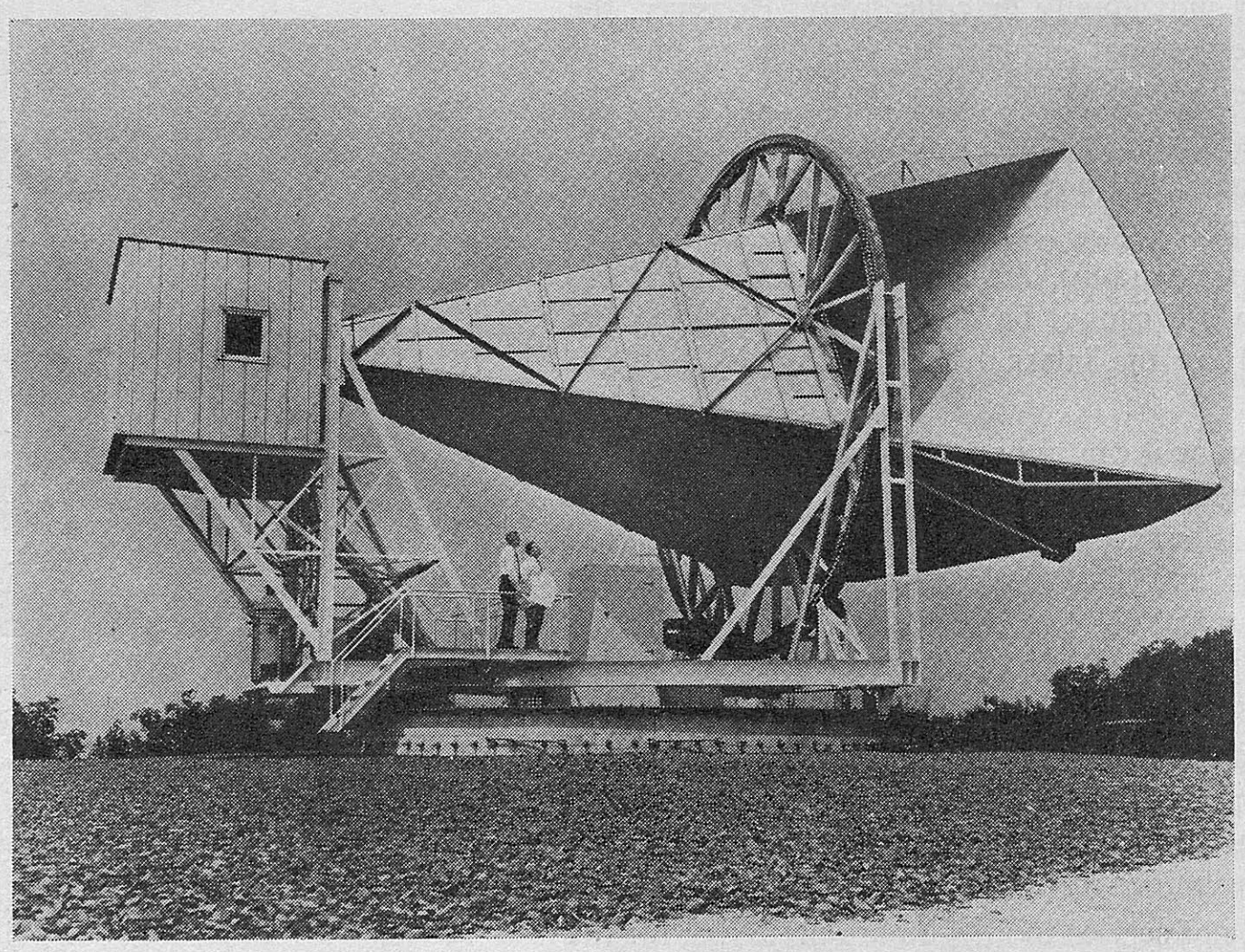

Horn antenna at Bell Telephone Laboratories, Holmdel, New Jersey. Originally built for the now famous NASA ECHO I experiment, the horn equipment has been modified to work with the Telstar communications satellite frequencies. The Holmdel horn antenna tracks Telstar and receives broadband signals from the satellite. Its transmission capabilities are not used with the satellite.

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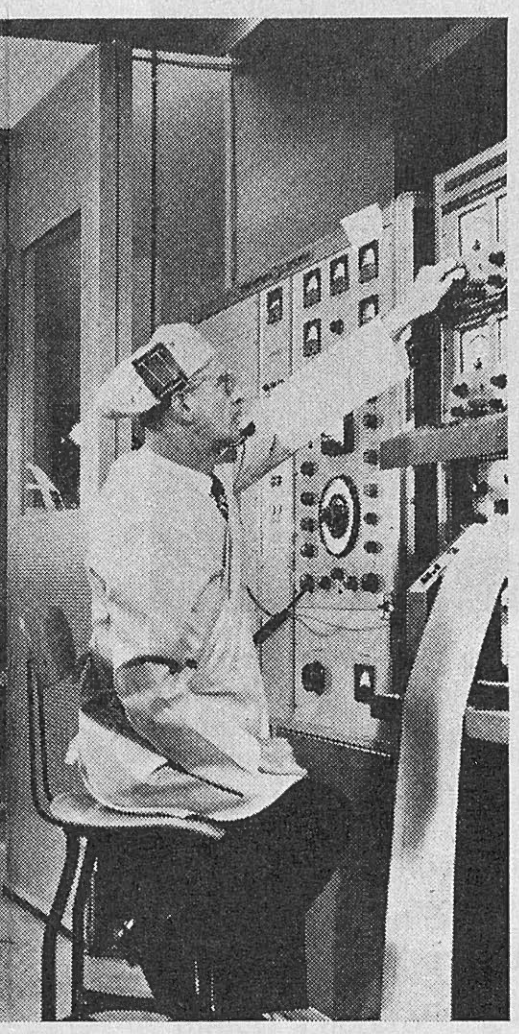

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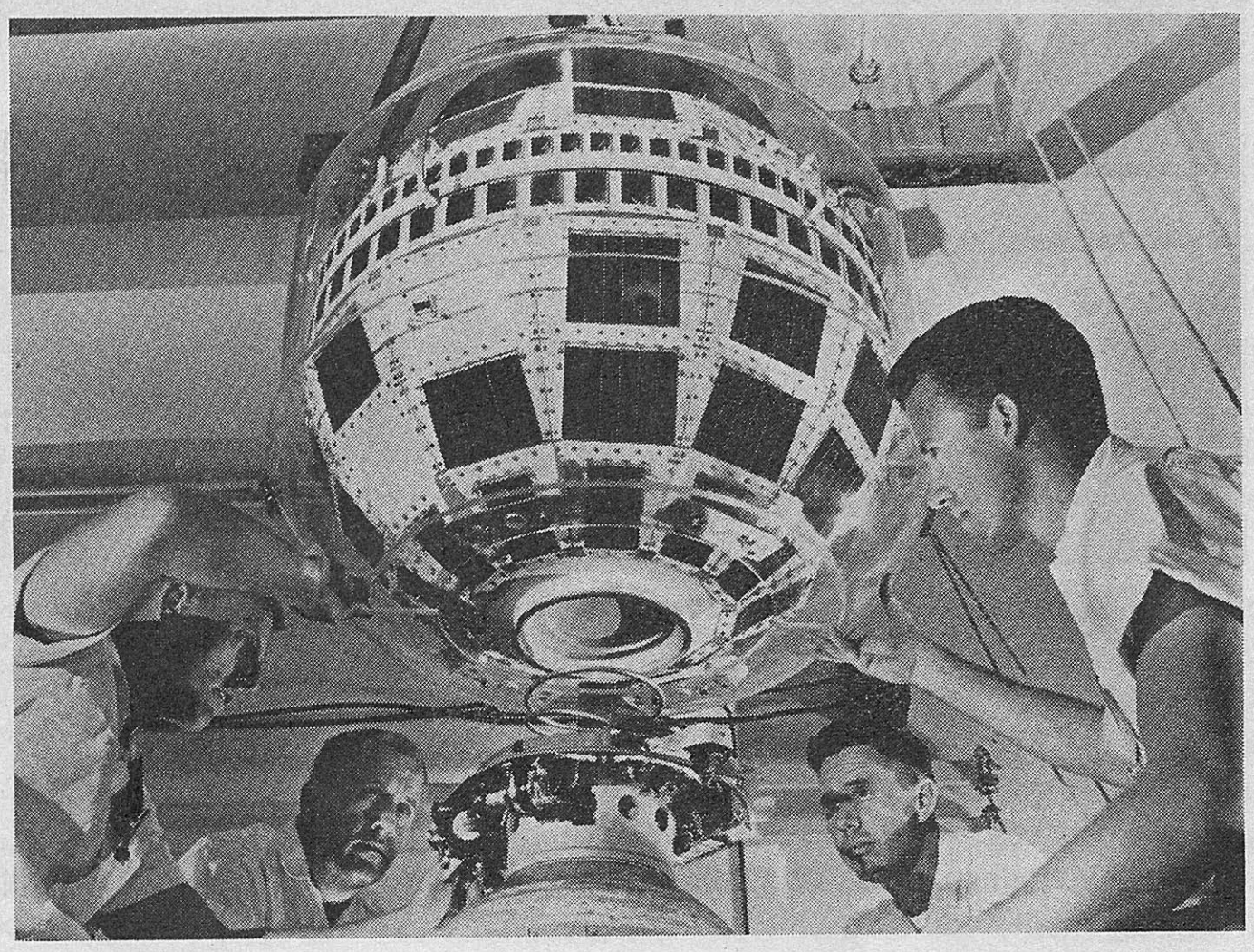

Douglas Aircraft Company technicians are shown mating the satellite to the third stage of a Delta rocket.

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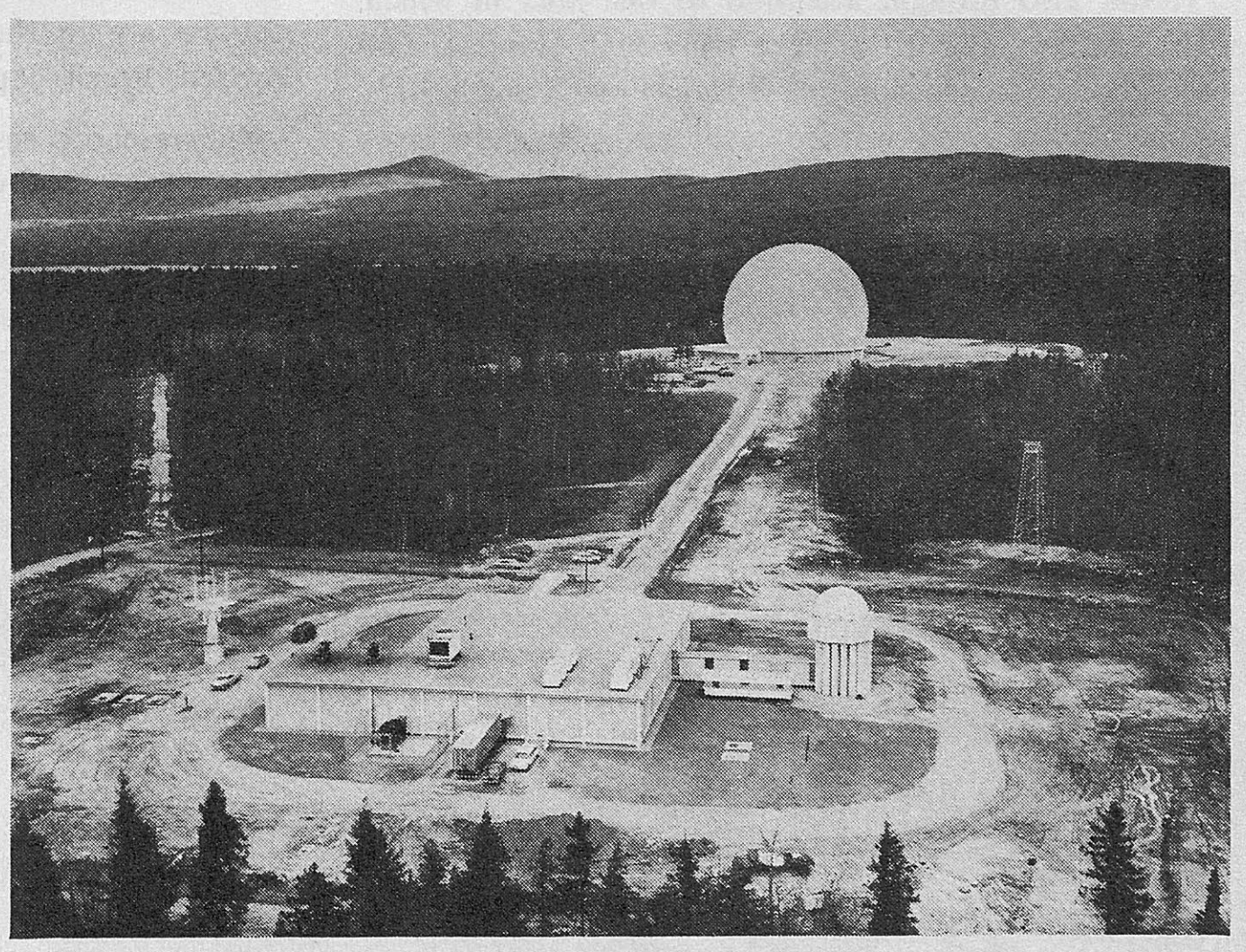
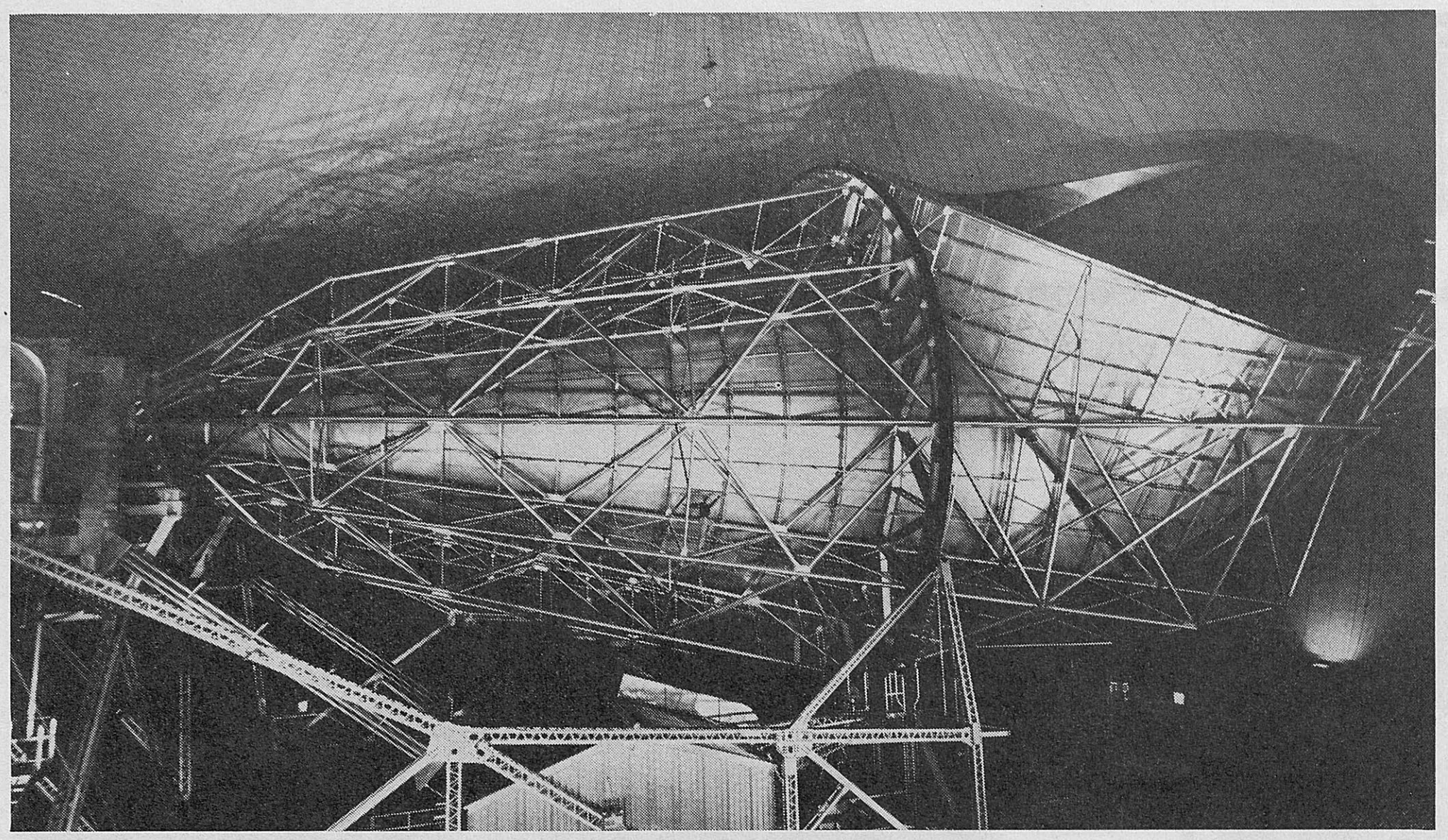


Aerial view of Bell System's satellite communications earth station near Andover, Maine. Control building in foreground houses control, computing and tracking equipment to operate horn antenna covered by huge dome seen in background, about 400 m. At left of control building, a helical antenna receives telemetry, sends commands up to and tracks the Telstar satellite.

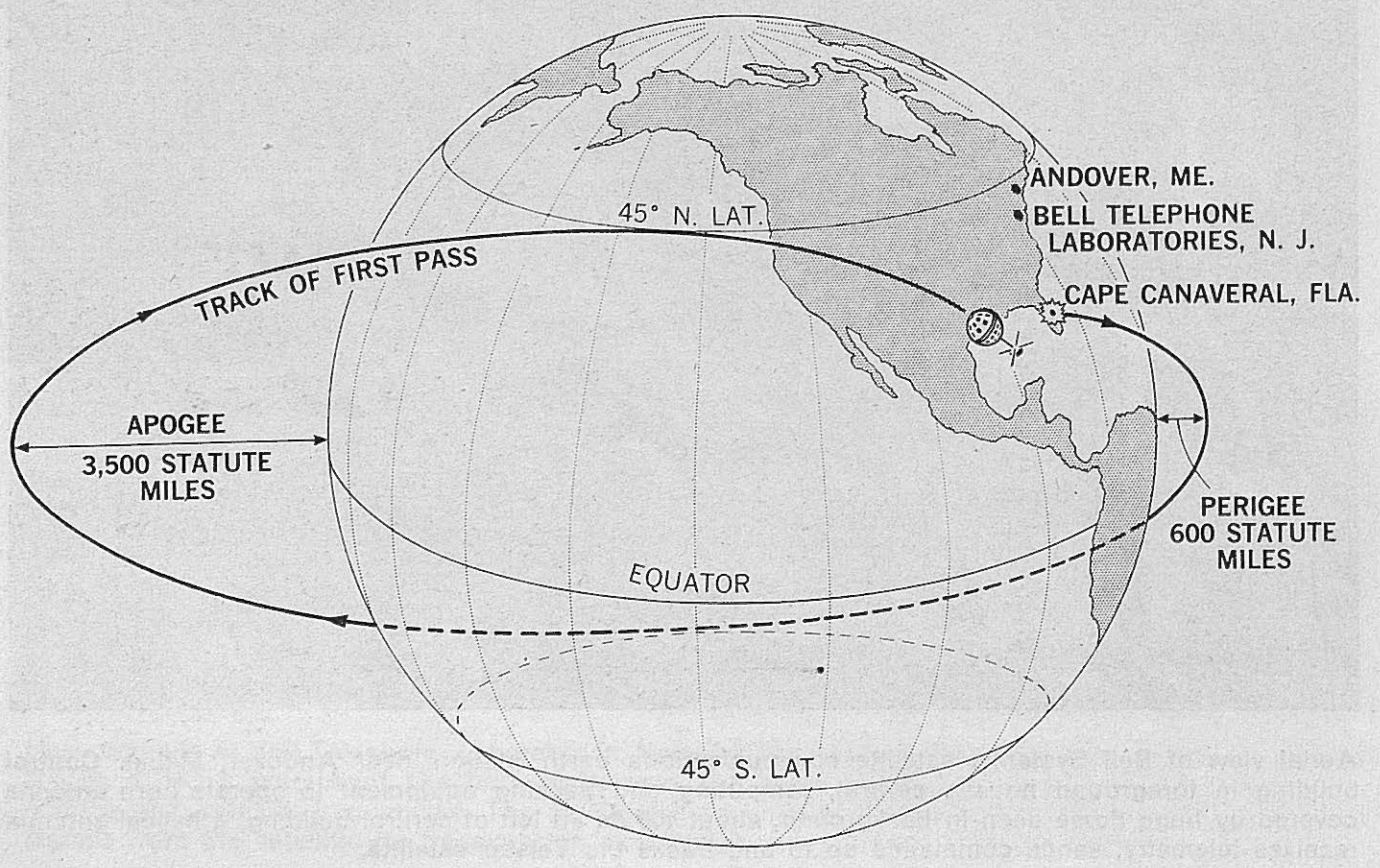


Huge horn antenna, weighing 380 tons, was completed and began simulated tests at its location in Andover, Maine, in April, 1962. Engineers use the horn to carry out experiments in broadband communications by way of the Telstar satellite. The horn transmits signals up to and receives signals from the satellite, a " space radio relay tower ". An engineer standing on structure in lower centre is dwarfed by the 54 m long antenna.

cations network which will be born with the Telstar system. Emerging nations with strained budgets will for relatively modest sums be able to build ground stations which will handle telephone or telegraph only, and later add television or other broad-band capability.

Telstar also brought attention to one area in which man has been able to achieve truly high standards of international cooperation. American, French and British ground station crews worked easily and efficiently together, while the world watched, in an outstanding example of the manner in which communicators of all nations have operated fruitfully for years under the aegis of the International Telecommunication Union. Realization of the international quality of Telstar also is growing. This satellite, although an American product, is useless unless the world uses it. And the world will use it. Ground stations are in the planning or construction stage in Sweden, Brazil, Japan, Germany and Italy.

The research results of Telstar also are of interest. In addition to relaying live television and other forms of



A sketch of the first orbit of Telstar
Each orbit is about 160 minutes.

Control room of the Bell System's satellite communications earth station near Andover, Maine. Manned by a technical team, the consoles in foreground are used for Telstar satellite tracking operations. Monitors on right are used for evaluating signal levels during transmit and receive tests to the satellite. Designed to operate automatically, tracking equipment can be used manually if required.

communications across the Atlantic, the Telstar satellite has been providing valuable scientific information since it was launched last July 10, the Bell Telephone System has reported.

Most encouraging is Telstar's report on itself—that it is in excellent condition in Space and that it is performing normally in its hostile surroundings.

With an apogee of 5600 km and perigee of 950 km, air drag is having little effect on Telstar's orbit. Also, the pressure of sunlight and " earthshine " have only a small effect. Therefore, a time in orbit of at least 200 years is predicted.

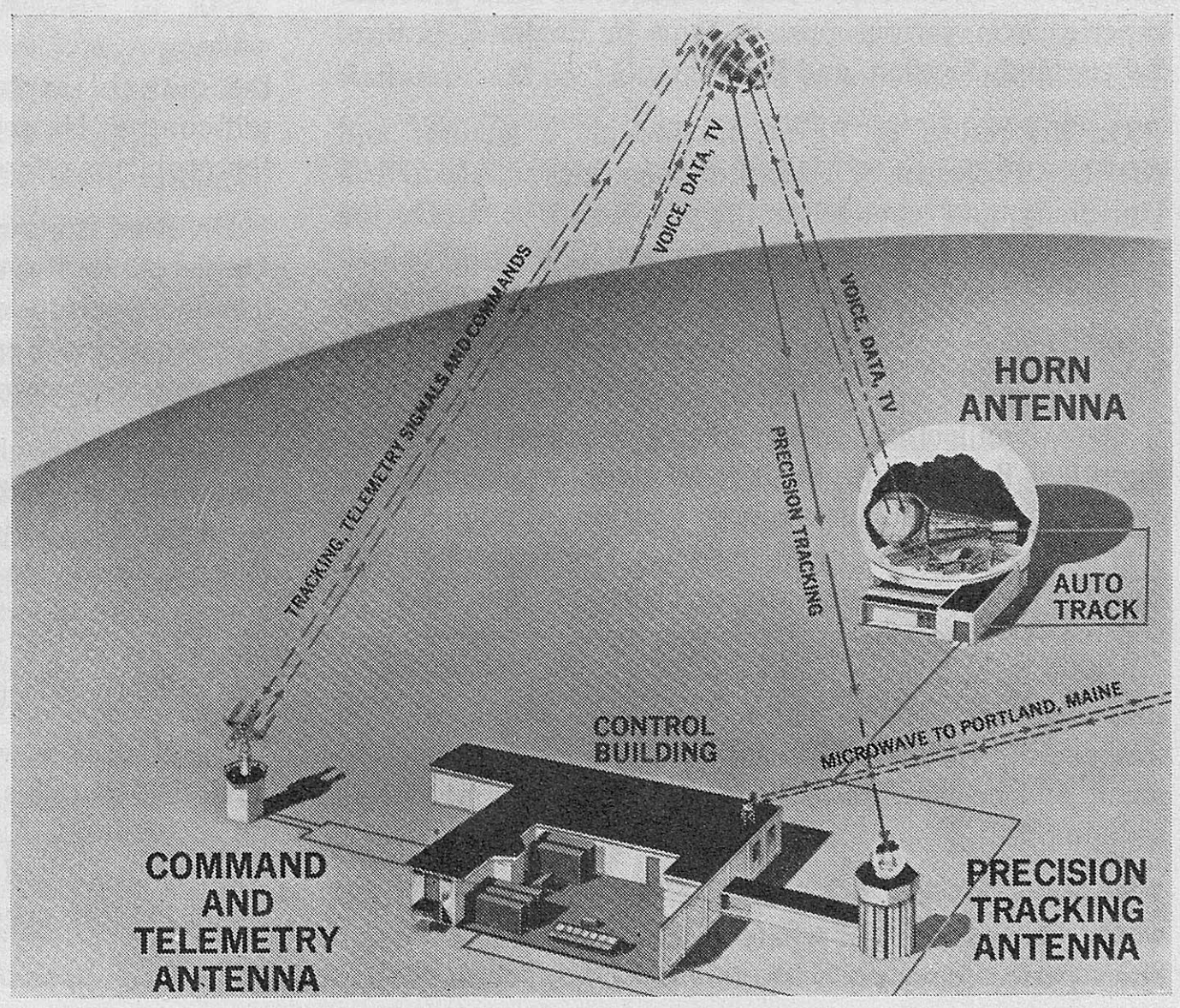
During launch, Telstar was set spinning at a speed of 177 revolutions per minute. The spin stabilizes the satellite gyroscopically and keeps its antennas pointed in the proper direction. This spin is slowing at the rate of only .35 per cent per day, a decline adequate to maintain Telstar's axial direction for at least two years.

Telstar's 3600 solar cells, which convert the sun's energy to electricity needed to power the satellite's equipment, survived the launch without damage. Results so far show that the cells, shielded from radiation damage by synthetic sapphires, are operating in accordance with earlier Bell Telephone Laboratories calibrations.

The pressure inside the cannister containing Telstar's electronic equipment also is being maintained. This indicates that the cannister has not been punctured by meteorites and that the gas, sealed under pressure inside, is not leaking out.

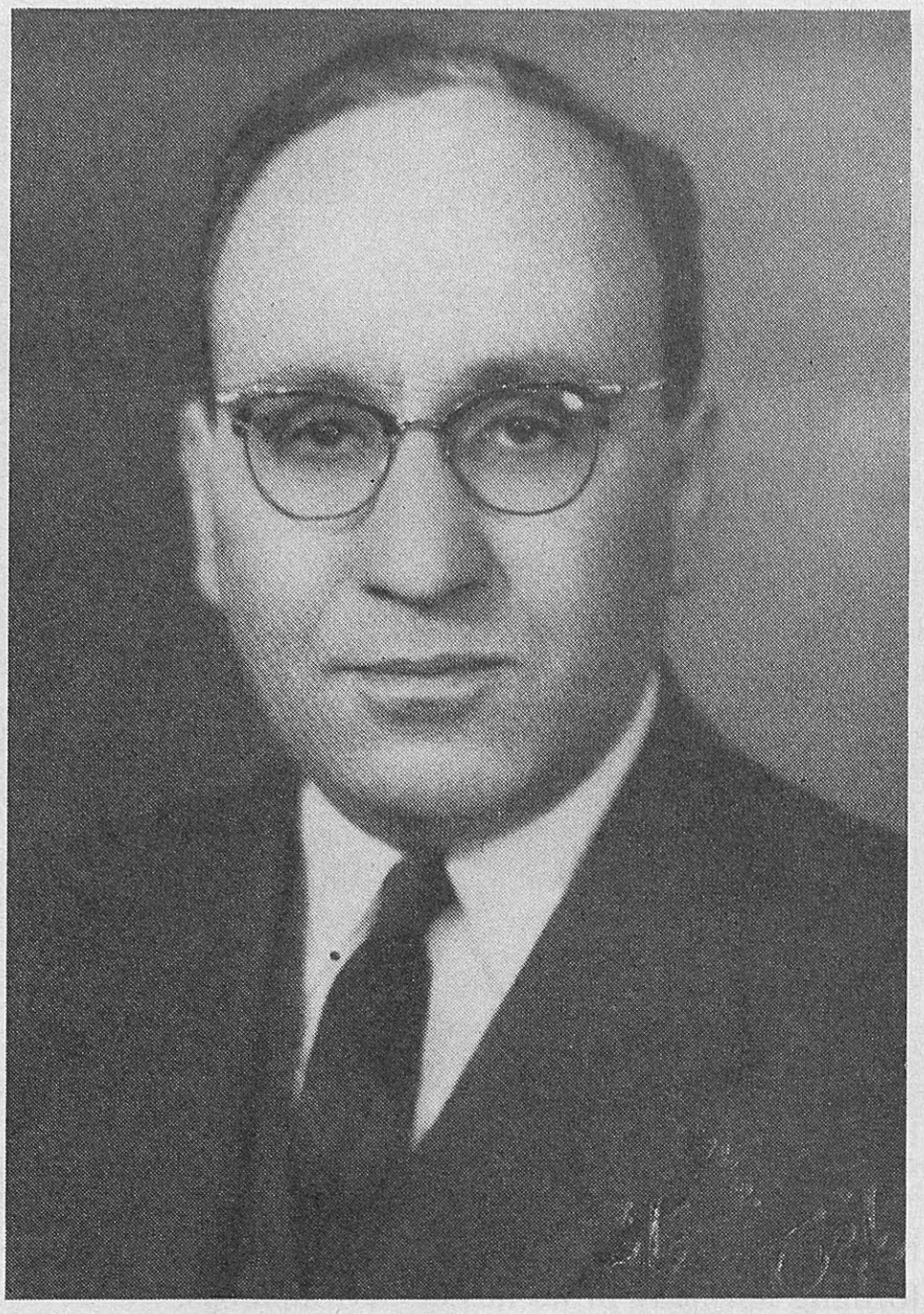
Temperatures inside the satellite are averaging 24°C, within three degrees centigrade of what was expected. Temperatures on the outer skin, measured by 12 thermistors at six places on the surface, have been ranging from —8°C to 9°C, also according to expectations.

Some of the scientific information is obtained through precise tracking of Telstar by the Bell System's Earth Station at Andover, Maine, and by the US National Aeronautics and Space Administration (NASA) stations around the world. Other data is obtained through communications tests to and from Telstar by Bell Stations at Andover and Holmdel, New Jersey; by the British station at Goonhilly, Cornwall, and by the French station at Pleumeur-Bodou in Brittany.



An artist's drawing of earth station near Andover, Maine, showing some of its functional uses with Telstar. The complexity of the station is indicated by the variety of electronic signals it handles as well as the variety of transmitting and receiving equipment it uses. For example, although the satellite broadband (voice, data, TV) circuits are 4170 Mc/s and 6390 Mc/s, other frequencies used by the station are 120 Mc/s, 136 Mc/s, 4080 Mc/s and 11000 Mc/s.

telepersonality



22 — MAHMUD MOHAMMED RIAD

THE GOVERNMENTS OF THE ARAB COUNTRIES faced with the necessity of choosing the person most capable of managing the new-born Arab Telecommunications Union, with headquarters in Cairo, unanimously elected Dr. Mahmud Mohammed Riad. Dr. Riad has been Director-General of Telecommunications in the Ministry of Communications of the United Arab Republic since 1957, and was clearly one of the few people of sufficient international stature and experience to occupy the post.

He was born in 1918, into a well-known Egyptian family. His father was a colonel in the Egyptian Army, twice wounded in the Sudan, and famous for his discipline and courage.

After finishing his secondary schooling, he entered the Faculty of Science in Cairo University, where he took a science degree. To become a fully-fledged engineer at the age of twenty-one, as he did, was an exceptional achievement for one of his generation. The Egyptian Government, always searching for talented engineers, leapt at the opportunity of securing his services. He remained in the Department of Telephony and Telegraphy until 1943.

From 1943 to 1945, Dr. Riad taught in the Faculty of Sciences at Alexandria University. However, always anxious to extend his knowledge and to possess a thorough grounding in his profession, he entered the University of London in 1945, where after three years he took the diploma of the Imperial College of Science and Technology. From 1948 to 1950, he acquired solid practical experience in various private firms in England, France, Switzerland, Sweden, and Denmark.

On his return to Egypt, he became a lecturer and Assistant Professor of Telecommunications in Alexandria University, and remained in the post for six years. During this time, he wrote several important papers, of which " Measurement of Residual Parameters of Variable Air Condensers " and " Units in Electrical Engineering " have appeared in the " *Engineers' Journal* ".

The young lecturer soon made his mark, and after the Egyptian Revolution, the government, anxious to do away with the old bureaucratic routine, appointed him in 1956 as head of the Electronics Department in the Atomic Energy Commission, in Cairo. A year later, he became Director-General of Telecommunications, and this post he still holds. He took up his appointment at a time when the department, as indeed the whole country, was passing through a period of high-pressure development, and he was, and still is, thoroughly equal to this arduous task.

Those who know the man have never doubted that he would be successful in whatever he undertook. He combines perfect courtesy with a *sangfroid* which is clearly the outward expression of an inward equilibrium and self-control. He never lacks the decision required to settle the problems referred to him.

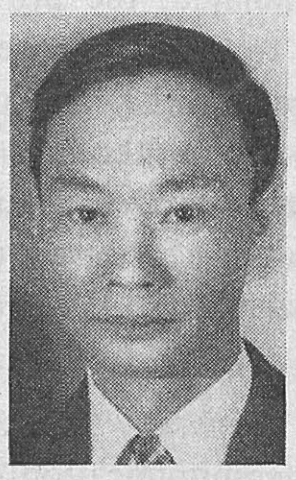
Dr. Riad is a member of the Council of Sciences of the United Arab Republic and an associate member of the London Institute of Electronic Engineers. He holds the " Order of the Republic ", awarded by the United Arab Republic Government, and the Swedish " North Star."

A calm, thoughtful, person, he is an indefatigable reader who can frequently be found, book in hand, quietly sitting in the Gezirah Sporting Club, the most exclusive club in Cairo. He is also a tireless traveller, who in the course of his duties has visited all the Arab countries, the United States, the USSR, and almost the whole of eastern and western Europe.

Dr. Riad is now a member of the ITU Administrative Council, where his diplomatic qualities have won respectful recognition. A great administrator, he is someone of whom the United Arab Republic and the entire Arab world may be proud. — F.S.

(Translated from French)

Dr. M. Joachim, CCIR Counsellor,

and  Dr. Y.Y. Mao, CCIR Engineer,

discuss ways to space communications

After the unforgettable " firsts " of the space era, back in 1957, the general public became more and more interested in all problems of Space. But not only for the general public did the launching of the first earth satellites open completely new horizons. Scientists of many branches found in space systems completely new possibilities of investigation. Many scientists in the field of telecommunication, when hearing the first " beeps " of a simple radio transmitter installed in the earth satellites, already imagined wide perspectives of development in space communications. Global networks of broad-band channels of communication, global instantaneous television, use of satellites for navigation, for meteorology and ionospheric research are some of these possible fields of application of satellites.

As has been already shown in several articles published in this *Journal*, three systems of communication satellites are under consideration and development at present: passive satellites, active satellites at altitudes between 5000 and 10 000 km, and synchronous satellites at altitudes of 36 000 km. Passive satellites are attractive because of their simplicity and the concentration of all the delicate equipment on the ground. They are largely independent in the choice of frequency used, and many frequencies can be used simultaneously. For a non-synchronous satellite a directional antenna system seems unavoidable otherwise the power demand would be excessive. Position control by infra-red and optical sensors and rather expansive system of feedback stabilisation are under development.

Antenna gains of the order of 60 db for non-synchronous, and of about 70 db for synchronous satellites are reported to be necessary respectively. Because of the narrow beam, a very high accuracy (about 0,1°) is needed for the position control of the antenna systems on ground. Radomes will probably be used to minimize the influence of wind pressure. The atmospheric refraction at low angles of elevation, and scintillations in the atmosphere are limiting factors for the practical antenna gain.

In addition to this, the increase in noise by the emission in the absorption bands of the atmospheric constituents must be taken into account. Because of the high directivity of the antennae used these noises appear more significant than the galactic and cosmic noise. A most difficult problem is the relative high temperature of the ground whose radiation is picked up by the side lobes. For this reason huge paraboloids up to 25 m and horns about 6 × 6 m are in use at present and paraboloids of 40 m and horns of 20 m are under development. This question is also connected with different cases of interference in Earth-Space communication at an angle of elevation Ψ (see figure 1).

Another important question is the use of highly sensitive devices for reception of extremely weak signals involved in space communications. This is the reason of masers (Microwave amplification by stimulated

emission of radiation) and parametric amplifiers are used in satellite communication. A noise temperature of 100°K seems to be obtainable for parametric amplifiers and as low as 10°K for masers.

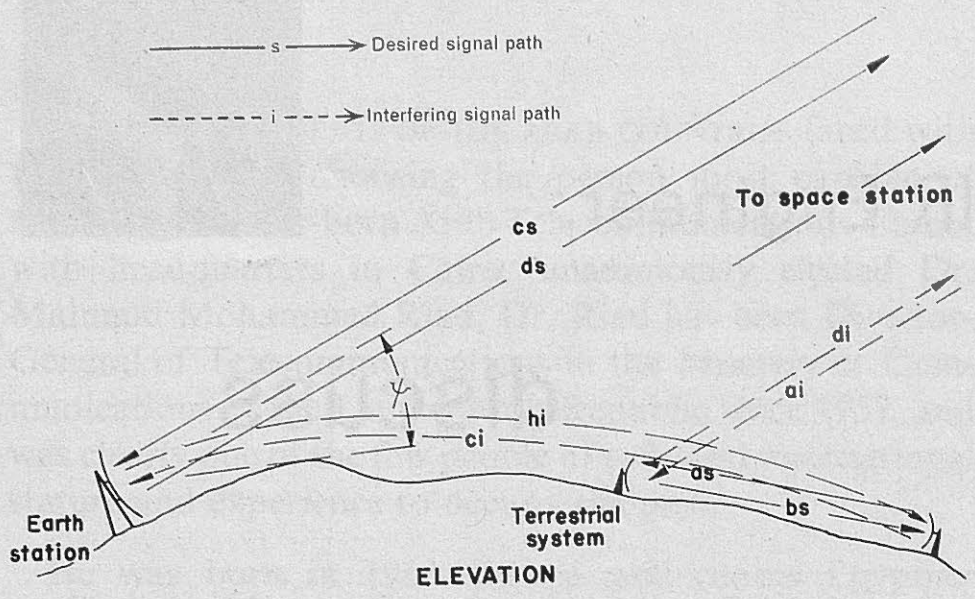


Figure 1

Four cases of interference (*a*, *b*, *c*, *d*) with Earth-Space communication at an angle of elevation (Ψ).

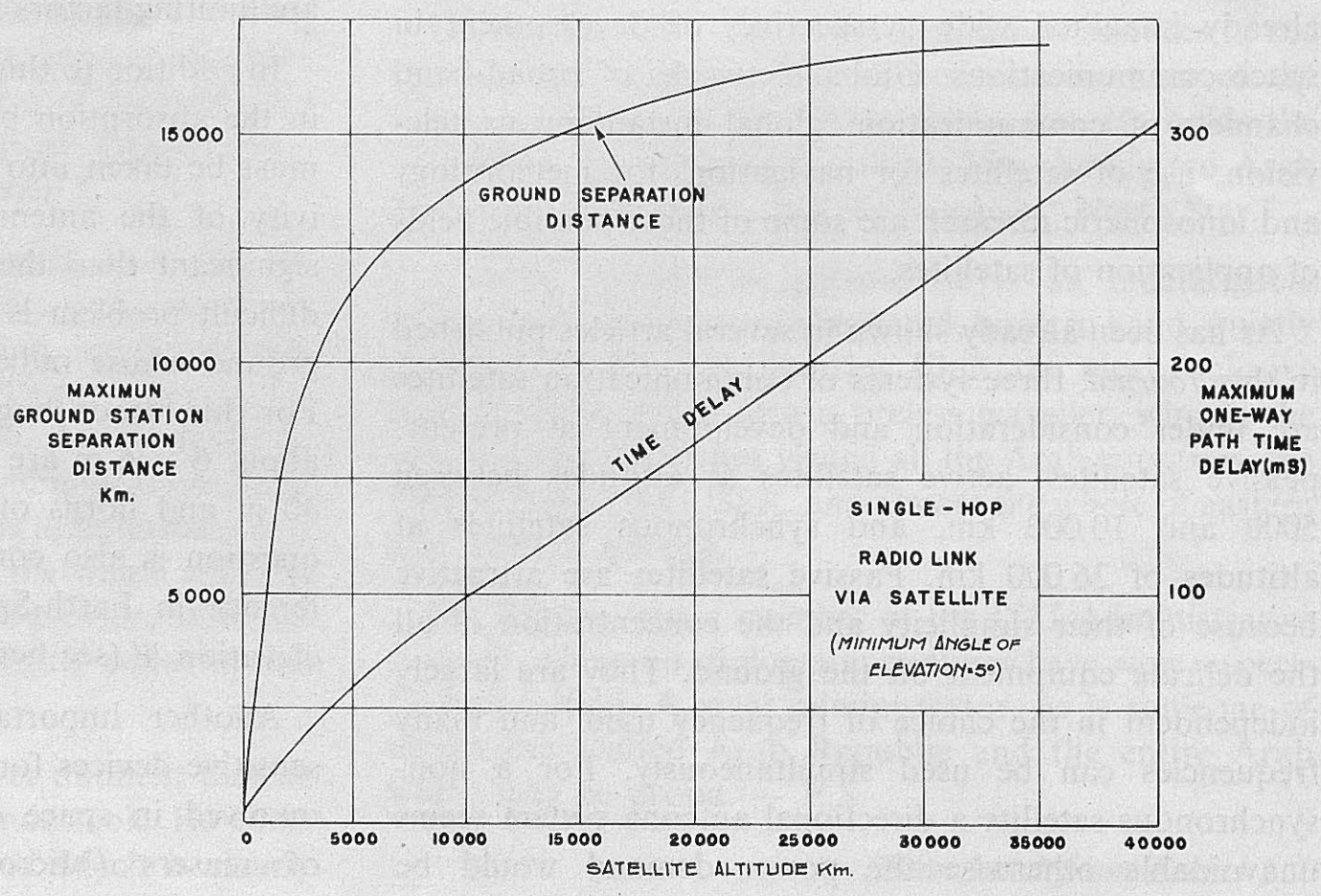
A large amount of technical work is still necessary to increase the reliability of the components used in apparatus involved in satellite communications, as the satellite-borne equipment will be in most cases, at least, unattended. Another important question is the supply of power for these equipments. For the moment, solar cells with buffer batteries are used, but the development goes towards nuclear power sources. It has been reported, that the performance and lifetime of solar cells are reduced, particularly by the high energy particles in the radiation belts. Coating with optically transparent, very resistant material will improve the lifetime.

As in all other branches of radiocommunications, immediately after the ideas of the principles of space communications had been formulated, the problem of frequency spectrum appropriate to these purposes arose. It would be premature to try to say what would be the result of these considerations. Some thought to this question was given at the Administrative Radio Conference, Geneva 1959 and allocations for space research can be found in the Radio Regulations, 1959.

For the future, different allocations will be made for various kinds of space service. Generally speaking, the frequency bands for satellite communication can be adjusted to be above 100 Mc/s due to the influence of the ionosphere and to frequencies below 10 000 Mc/s due to scattering and absorption of atmospheric precipitation. For the space-space service (communication between satellites and space vehicles), the highest radio frequencies (SHF, EHF and decimillimetric waves) will probably be used, as well as coherent light radiations. The allocation of these bands for the given purposes appears desirable, as there will be, in this case, less interference with terrestrial services, since the EHF band undergoes high absorption when passing through the atmosphere and the ionosphere.

For investigation of communication systems between points on the ground with retransmissions or reflection from satellites, it has been suggested that the frequencies in the range of about 3-6 Gc/s be used. The bandwidth of the radiated signal is determined by the nature of the information transmitted and by the type of modulation.

Figure 2



To obtain a large signal-to-noise ratio at the output of the radio receiving equipment, it is probable that special types of modulation will be used, e.g. pulse code modulation or frequency modulation with a high modulation index. For most applications, PCM seems preferable because of less bandwidth and less power required.

The use of artificial earth satellites has also been proposed for top ionospheric sounding and bands in 10, 20 and 40 Mc/s ranges have been suggested for this purpose.

Tracking of satellites and reception on the earth of telemetering data from satellites and space vehicles, and transmission from the earth of control signals will probably not require large frequency bands. The appropriate bands (some tens of kc/s in width) will be in the range of some tens of Mc/s to several Gc/s.

As these bands are, for the time being, allocated to other services, the allocation of exclusive bands would involve large technical and operating costs. For these reasons careful consideration is been given to the possibility of showing the bands likely to be allocated for space communication with other services.

Another time delay is the delay between the satellite ground station terminal equipment and the central telegraph office, including time taken to translate individual channels up to, or break down from, the wide-band system. Taking the two ends together, these delays may be of the order of 25 to 50 ms for each direction of transmission.

Still another time delay is that accounted for by an HF or scatter radio tail which might be necessary at one end. Since this would require the use of a channelling system suitable for use over such radio links, substantial additional delays would be introduced. In each direction of transmission, between 25 and 50 ms may be absorbed in this way.

Finally, the difference in time due to path length changes would affect any telegraph circuit using synchronous printing or error-correcting systems in which terminal synchronisation was required. At 100 Bauds transmission speed, for example, each element of a 7-unit code would occupy 10 milliseconds and, with a 2-channel system, it would be possible to " slip " a fraction less than half an element, say 4 ms, without loss of phase. Modern

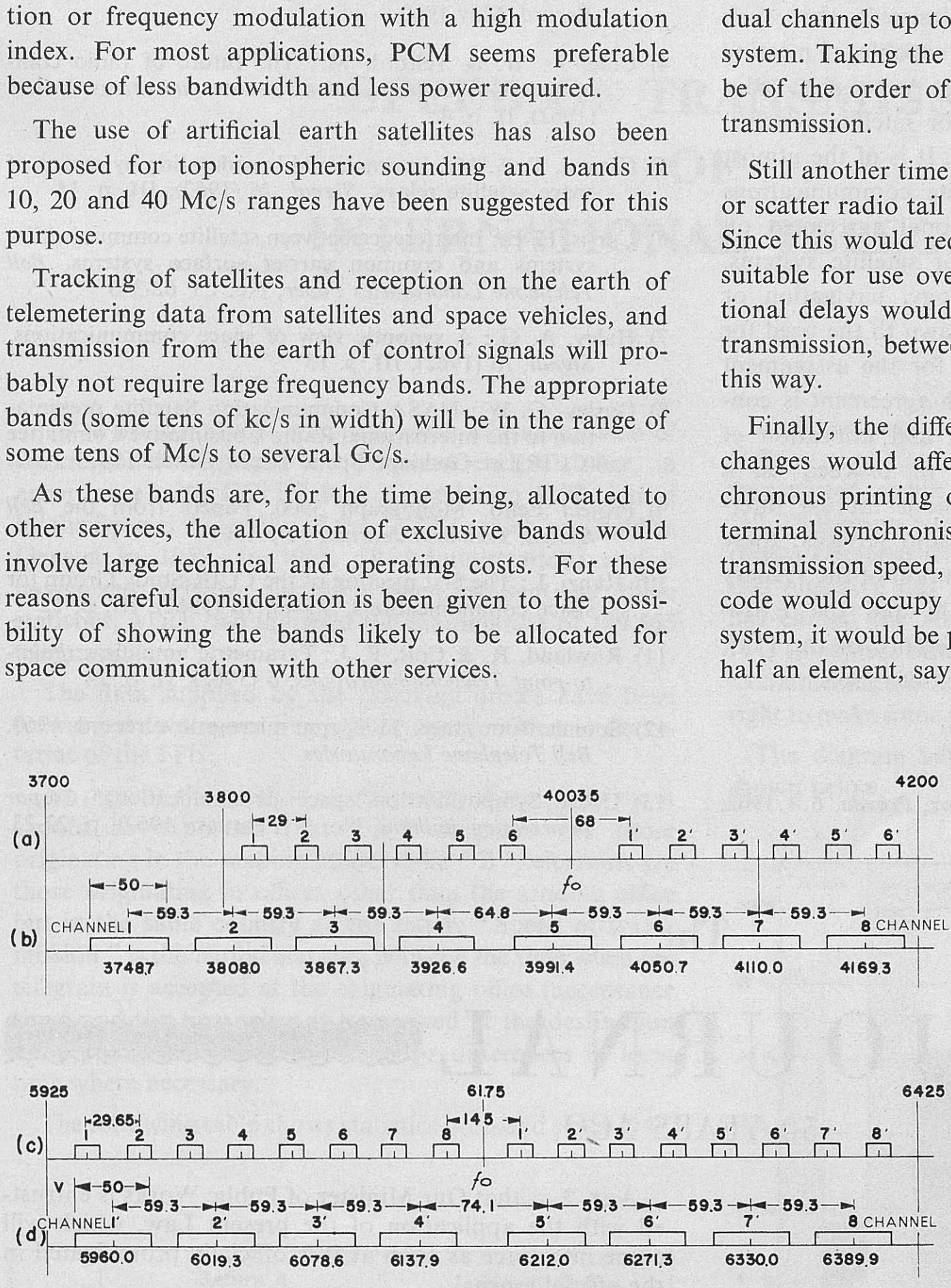


Figure 3

Example of a possible radio frequency channelling arrangement for satellite systems, sharing same frequency bands as 4000 and 6000 Mc/s radio-relay systems.

(a) Radio-relay systems (CCIR Recommendation No. 278).

(b) Satellite systems (Transmit from satellite).

(c) Radio-relay systems (CCIR Recommendation No. 280).

(d) Satellite systems (Transmit from earth). Frequency in Mc/s.

Another problem involved in space communication is the effects of transmission time delay and switching discontinuities.

Figure 2 shows the maximum path time delays and maximum separation distances between ground stations as a function of satellite altitude for a single-hop link with 5° minimum angle of elevation of the ground station antennae. With two-hop satellite links, these would be rather less than twice the above values according to the amount of overlap of the coverage areas of the two satellites. For example, a circuit relayed via two hops, with satellites in a circular orbit at 10 000 km, would suffer a delay of the order of 170 ms, while for circuits relayed via two satellites in the synchronous orbit, the delay would be of the order of 530 ms.

ARQ equipment would automatically re-phase, and there would be an interruption of only about 4 ms, provided that a suitable out-of-phase detection device is employed.

Various techniques might be adopted to overcome the effects of delay differences at switching. For example, one arrangement would be to introduce into each ground-satellite-ground path a variable time delay, such that, when combined with the propagation delay (which is itself variable), a constant overall delay would be obtained. The magnitude of the constant delay would be fixed and equal to the maximum propagation delay anticipated plus the sum of the different other delays.

With a view to the economic use of the frequency spectrum, the channelling arrangements for satellite communication systems must be decided in due time.

Such arrangements should take into account the probable operational requirements, in particular, the traffic capacities needed. Since these cannot be stated precisely at the present time, it is clearly desirable that such arrangements should be flexible and capable of meeting a range of operational requirements. A possible radio frequency channelling arrangement for satellite systems, shown in figure 3 has been suggested. It is of the utmost importance for the future of satellite communications that there should be early international agreement on radio-frequency channelling plans for satellite systems, be it for communication, meteorology, navigation or other purpose. Attention has been drawn to the need for an internationally agreed procedure for the assignment of channels for specific systems. Such agreement is considered essential if the development and utilisation of satellite communication systems is to proceed on a coordinated and orderly basis, without mutual interference, or interference with other radio services; these matters will no doubt receive the attention of the Plenary Assembly of the CCIR, New Delhi and the Extraordinary Administrative Radio Conference of the ITU, to be convened in Geneva from 7 October 1963.

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7) Haley, A. G.: A synoptic view of space communications, *Signal*, *16* (1962), III, p. 15

8) Ousley, G. W.: NASA Communication Satellite presentation to the International Radio Consultative Committee (CCIR) at Goddard Space Flight Center (14.3.1962)

9) Project Echo, Monograph 3900, Papers from the *Bell System Technical Journal*, July 1961

10) Ranzi, I.: The first meeting of the CCIR Study Group for space communications, *Signal*, *16* (1962), III, p. 12

11) Rowland, R. & Cott, P. J.: Parametric amplifiers, *Point-to-point Telecommunications*, *6* (1962), II, p. 24

12) Sounds from space, 33 $^{1}/_{3}$ rpm microgroove record, 1960, *Bell Telephone Laboratories*

13) URSI Symposium on space communications, *Cospar Information Bulletin*, No. 8 (February 1962), p. 22-23.

The JOURNAL 50 YEARS AGO

EGYPT

Law governing radiotelegraphy

"We, the Khedive of Egypt,

At the proposal of our Minister of Public Works and the consonant advice of our Council of Ministers;

Having heard the Legislative Council,

Hereby decree:

ART. 1 — that wireless telegraphy constitutes a State monopoly. No wireless telegraphy installation may be set up or employed for the transmission of correspondence except by the Government, or with its authorisation.

ART. 2 — that Our Minister of Public Works is entrusted with the application of the present Law, which will come into force as soon as it is officially promulgated in the official journal.

Done at the Palace of Ras El-Tin, the 18th Rabi El Awal 1324 (12 May 1906)

ABBAS HILMI

By the Khedive:

The President of the Council of Ministers:

(Signed:) MOUSTAFA FAHMI

The Minister of Public Works:

(Signed:) HUSSEIN FAKHRY"

★★★★★

Long distance telephony

"The opening of a direct telephone service between Germany and Italy, via Switzerland, is expected in the near future. In view of the great length of the line, the wire diameter chosen is 4 ½ mm; nevertheless, rates will be relatively low. The frontier-to-frontier transit line in Switzerland has been set up by the Federal PTT Administration at its own expense, and Switzerland will receive a share of 2 fr. per 3-minute call. In addition, Germany and Italy will levy a charge of 1 to 2 fr. according to the areas in which the corresponding stations are situated. Night calls will cost only 3/5 of the corresponding amount for a day call, and half-rate monthly subscriptions will be available."

★★★

JOURNAL TÉLÉGRAPHIQUE — October 1912

SPEED OF TRANSMISSION OF INTERNATIONAL TELEGRAMS

STATISTICS CONCERNING THE SPEED of transmission of international telegrams are prepared each October, in accordance with CCITT Recommendation F.90, issued by the Special Assembly of the CCITT which was held in Geneva in 1958. In 1961, 58 Administrations and 6 recognized private operating agencies sent us these statistics, which had involved the examination of 189 565 telegrams.

The data supplied by the receiving offices have been forwarded to the sending offices by the General Secretariat of the ITU.

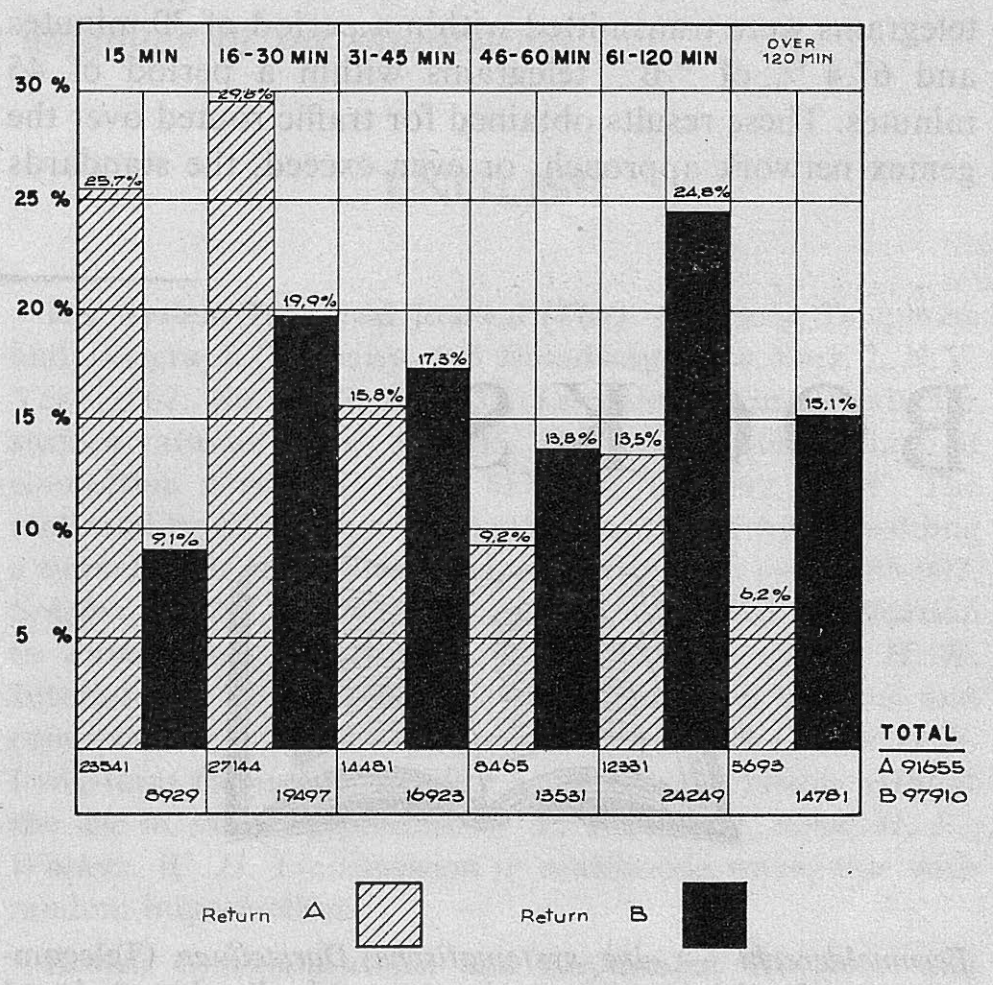
As regards the method of preparing these statistics, it should be explained that " A " telegrams are those originating in the sending office, while " B " telegrams are those originating in offices other than the sending office but in the same country as the latter. " Speed of transmission " is the period elapsing between the time when the telegram is accepted at the originating office (acceptance time) and the time when it is received at the destination office (reception time), allowing for differences in local time where necessary.

The following table shows statistics prepared since 1948.

Year	Return A		Return B	
	Telegrams	Percentage disposed of within 30 minutes	Telegrams	Percentage disposed of within 45 minutes
1948	36 707	36.6 %	29 914	40.6 %
1949	54 411	39.5 %	45 264	42.8 %
1950	68 286	42.4 %	57 777	47.1 %
1951	74 230	41.8 %	62 201	42.3 %
1952	73 778	45.2 %	65 196	47.5 %
1953	90 040	54.1 %	73 642	54.4 %
1954	92 013	57.0 %	77 590	60.0 %
1955	101 922	52.4 %	85 653	56.0 %
1956	99 963	53.2 %	84 111	51.9 %
1957	97 535	54.8 %	80 720	53.4 %
1958	99 588	58.5 %	80 916	55.8 %
1959	77 466	60.8 %	80 943	53.7 %
1960	93 083	54.9 %	94 478	48.0 %
1961	91 655	55.3 %	97 910	46.3 %

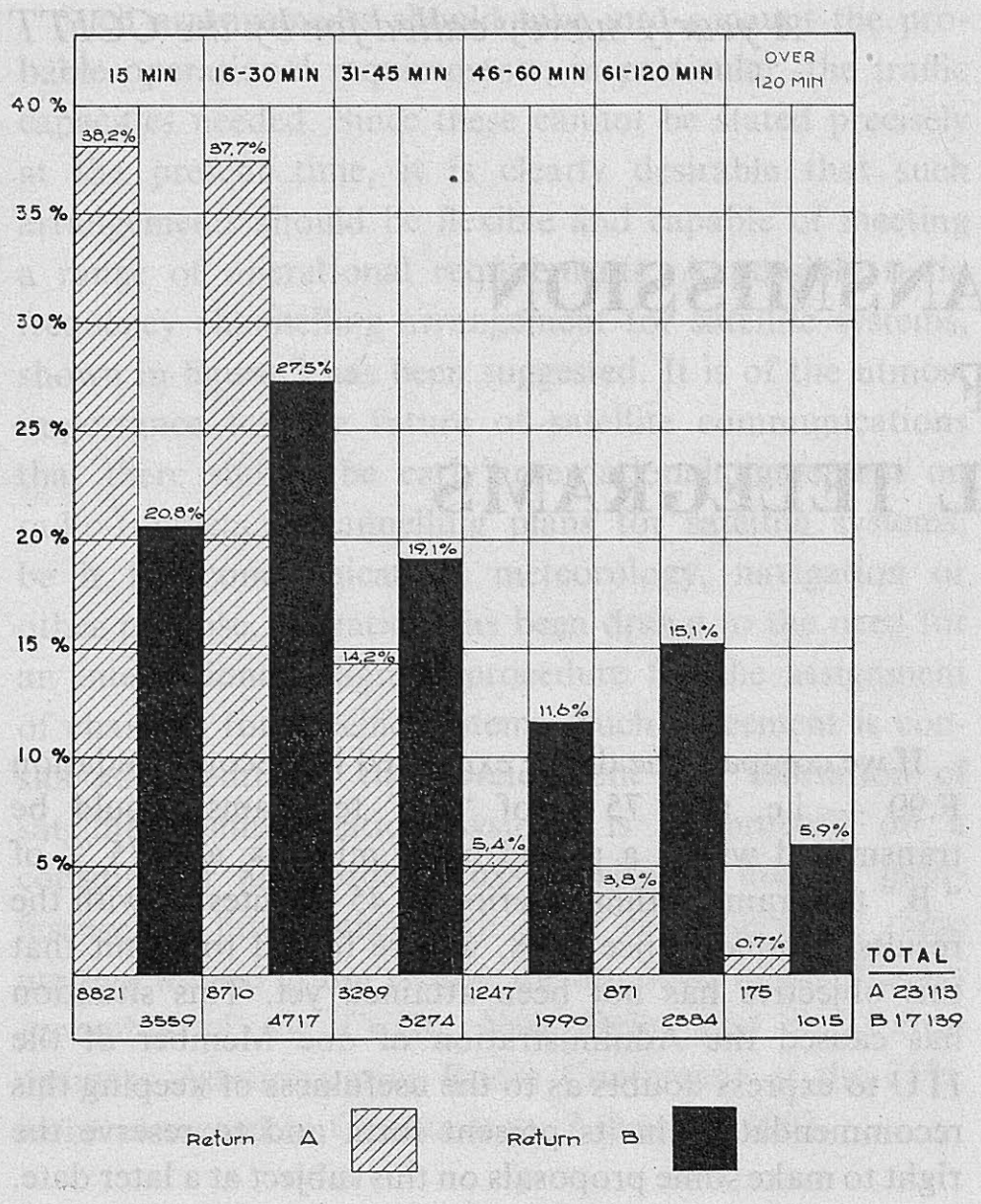
If we compare the desire expressed in Recommendation F.90 — i.e. that 75 % of " A " telegrams should be transmitted within a period of 30 minutes, and 75 % of " B " telegrams within a period of 45 minutes — with the results obtained since 1948, we are forced to admit that this objective has not been attained yet. This situation has caused the Administration of one Member of the ITU to express doubts as to the usefulness of keeping this recommendation in its present form and to reserve the right to make some proposals on this subject at a later date.

The diagram advocated by Recommendation F.90 is shown below.



In order to make the statistics clearer for the Administrations, the General Secretariat decided to separate the data supplied concerning the speed of transmission of telegrams sent over the gentex network on the one hand and over " station-to-station " relations on the other. These data are as follows:

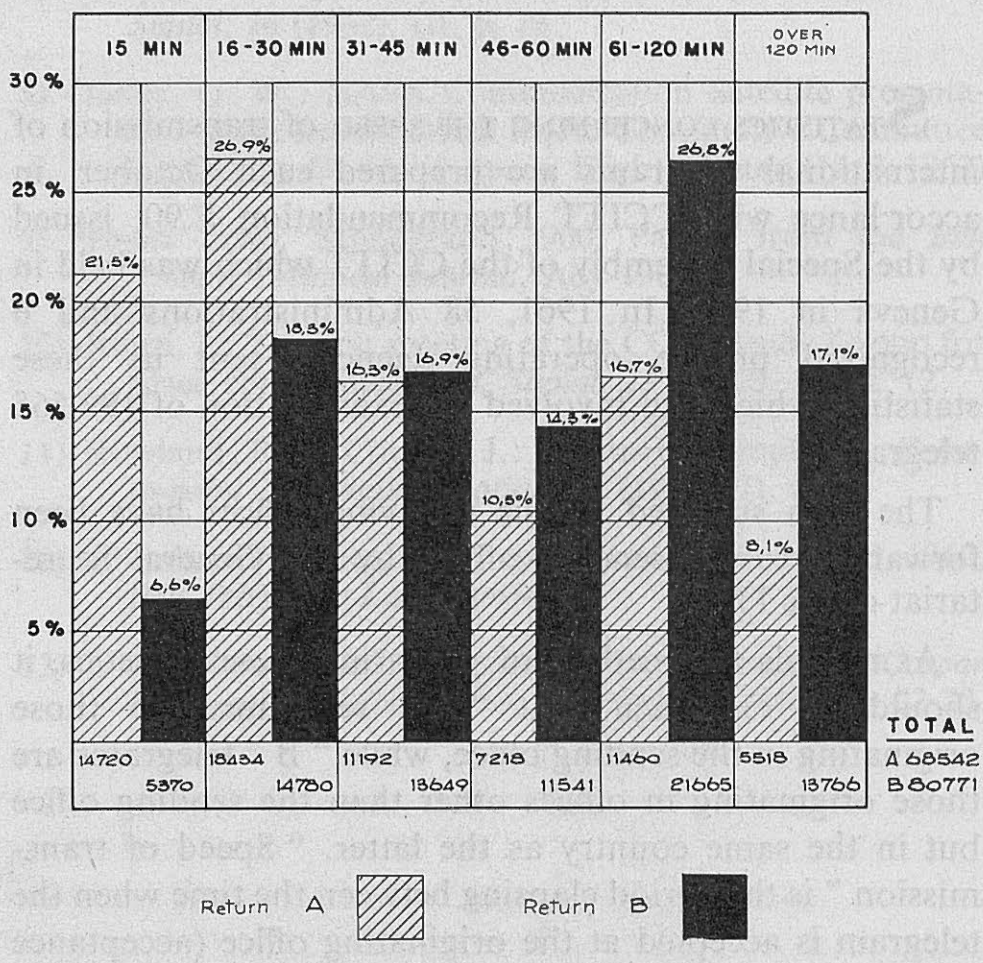
a) Gentex—
- 25.2 % of general traffic for " A " telegrams
- 17.5 % of general traffic for " B " telegrams



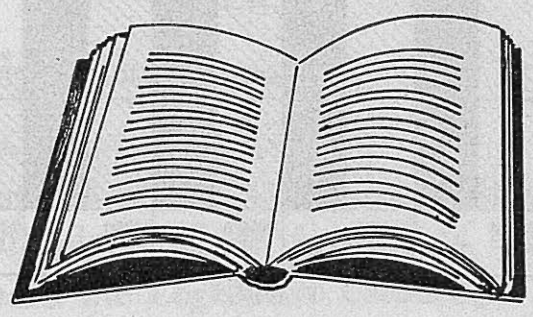
This diagram shows that in 1961, 75.9 % of " A " telegrams were transmitted within a period of 30 minutes and 67.4 % of " B " telegrams within a period of 45 minutes. These results obtained for traffic routed over the gentex network approach, or even exceed, the standards specified in Recommendation F.90.

b) Station-to-station
- 74.8 % of general traffic for " A " telegrams
- 82.5 % of general traffic for " B " telegrams

With figures of 48.4 % of " A " telegrams sent within a period of 30 minutes and 41.8 % of " B " telegrams sent within a period of 45 minutes, the results for telegrams transmitted in " station-to-station " relations are well below the standards recommended.



BOOKS



Fernmelderecht — eine systematische Darstellung (Telecommunication law—a systematic account) by Joachim Aubert.[1]

As a result of the issue of some important enactments in 1939 and 1942, the extensive study of German telecommunication and broadcasting law by Dr. E. Neugelbauer, published in 1929, had become obsolete in several respects. Specialists were asking for a revision of *Neugelbauer*, or better still, a work based on new developments. Their needs have now been more than met. Dr. Joachim Aubert, a Ministry counsellor, has just published in a single volume a systematic study of the whole of German telecommunication law.

After examining the position of this law in the general legal system, the author defines the legal status of the German Post Office which, under powers delegated by the Federal Republic, exercises sovereign rights in this field. He then develops the question of the rights to use telecommunication and the criminal law by which it is protected. A long chapter is devoted to the right to lines of telecommunication, and another one to the sometimes very intricate questions raised by the harmful influence of power plant on telecommunication networks. The liability of the German Post Office and its staff is then studied from all aspects. The final chapter deals with the protection of the right of operation and of the civil rights of telecommunication installations. This and other chapters are furnished with numerous references to the jurisprudence of the German courts.

Just as J.-D. Ricard is the author most often resorted to by French-speaking specialists in the matter of French law and jurisprudence in the postal and telegraph field, Aubert has become the best source for the study of German telecommunication law.

V. M.

[1] One bound volume; pp. xx+514. 21×15 cm. Published by *R. von Decker's Verlag*, Heimhuderstrasse 53, Hamburg (Federal Republic of Germany), 1962. Price 40.80 German marks.

★ ★ ★

Radar — Grundlagen und Anwendungen (Radar — rudiments and uses) by W. Bopp, G. Paul, W. Taeger, directed by H. Pooch [1].

This work describes the operative principles of different types of radar. The introduction contains some elements on the history of radar development, including developments in this field in Nazi Germany. Other subjects are dealt with,

such as the propagation of electromagnetic waves employed in radar technique, the influence of polarization and the selection of frequencies.

The radar processes referred to include the use of the Doppler effect, frequency modulation and pulses. Simple formulae are also given for calculating the range of action of radar. A considerable part of the book describes the principles of antennas, transmitters, receivers and indicators for radar systems, and the special tubes used in these instruments. Attention is also devoted to the use of radar in meteorology, astronomy and transport by land, river, sea and air. Questions of the transmission of radar displays are dealt with in the final chapter of the work.

The book provides a complete, balanced and intelligible survey of the field or radar. It is simply written and should present no difficulty to users of radar, who are not radio experts. Despite the simplified method of presentation, no errors are observable from the technical standpoint. The bibliography makes reference to some works in English and German, and to some translations into these two languages.

M. Joachim.

[1] One bound volume; pp. 288, illustrations, tables, diagrams. 24×17 cm. Published by *Fachverlag Schiele und Schön GmbH*, Merktgrafenstrasse 11, Berlin SW 61, 1962. Price 42 German marks.

★★★

World radio television handbook, by O. Lund-Johansen.[1]

The sixteenth edition of this handbook, which is of undoubted value both to specialists and to amateurs, has been published. It contains a complete list of sound and television broadcasting stations working throughout the world, together with their characteristics. The handbook is illustrated by maps and tables. The summer, 1962, supplement, which came out in July, has been completed by a list of world short-wave stations.

V. M.

[1] One volume paper cover; pp. 228, illustrations, tables, maps. 22×16 cm. Published by *O. Lund-Johansen*, Lindorffsallé, No. 1, Hellerup (Denmark), 1961. Price 18.50 Danish crowns.

REVIEW REVIEW

A list of articles in other technical publications which may be of interest to readers of the Journal.

The articles are listed under the language of the publication.

FRENCH

Annales des télécommunications. 3 et 5 bd. Pasteur, Paris 15e. Année 1962. **No 5-6.** P. 94-98. *Poincelot, P.* Théorie du câble coaxial.

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No. 8. P. 574-579. *Bray, W. J., Taylor, F. J. D.* The P.O. satellite system ground station at Goonhilly Downs. — P. 584-586. *Husband, H. C.* The 85ft steerable dish aerial at Goonhilly Downs. — P. 590-591. The five-kilowatt travelling-wave tube. — P. 592-594, *Petheram, A. R.* The output stage for the ground transmitter for project Telstar. — P. 596-598. *Walling, J. C., Smith, F. W.* The solid state maser in satellite communication systems.

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THE GOVERNMENT OF GHANA has kindly contributed to the decoration of the new ITU Headquarters by commisioning *Kofi Antubam*, one of the greatest Ghanaian artists, to paint a fresco symbolizing "Traditional means of communication in Ghana".

INTERNATIONAL TELECOMMUNICATION CONVENTION, GENEVA, 1959

The **Czechoslovak Socialist Republic** has ratified the International Telecommunication Convention of Geneva (1959).

The instrument of ratification, dated 26 June, 1962, was deposited with the General Secretariat of the Union on 1 August, 1962.

The **Syrian Arab Republic** has acceded to the International Telecommunication Convention of Geneva (1959).

The instrument of accession was deposited with the General Secretariat of the Union on 24 August, 1962.

RADIO REGULATIONS, ADDITIONAL RADIO REGULATIONS (GENEVA, 1959)

The **Overseas Territories for the international relations of which the Government of the United Kingdom of Great Britain and Northern Ireland are responsible** have approved the Radio Regulations and Additional Radio Regulations (Geneva, 1959).

INTERNATIONAL RADIO CONSULTATIVE COMMITTEE (CCIR)

Smoothed monthly sunspot numbers — 1st October 1962

Predictions for the coming months:

	October	27	November	25	December	24
1963	January	23	February	22		

(Values kindly provided by Prof. Waldmeier, Federal Observatory, Zurich)

Calendar of ITU conferences and meetings

Date	Title	Place
1962		
	International Telegraph and Telephone Consultative Committee (CCITT):	
27 Sep.-2 October	Study Group III (Tariff principles)	Geneva
2-8 October	Study Group VI (Protection against corrosion)	Geneva
3-12 October	Study Group I (Telegraph operating and tariffs)	Geneva
9 October	Joint Working Party of Study Groups V and VI (Lightning)	Geneva
10-19 October	Study Group V (Protection)	Geneva
15-19 October	Special Study Group C (Noise)	Geneva
22 October	Joint Working Party of Study Groups V and XV (Power feeding of repeaters)	Geneva
23-26 October	Working Party of Study Group XV (Telegraph circuits)	Geneva
29 Oct.-9 November	Study Group XV (Transmission systems)	Geneva
5-16 November	**Plan Sub-Committee for Latin America**	Bogotá
12-16 November	Working Party of Study Group XIV (Facsimile transmission)	Geneva
19-22 November	Working Party of Study Group IX (Telegraph transmission performance)	Geneva
23-29 November	Working Party of Study Group IX (Voice-frequency telegraphy)	Geneva
30 Nov.-5 December	Working Party of Study Group IX (Telegraph maintenance)	Geneva
1 October	**Group of Experts** to study the possibility of revising the **procedures for Ordinary Administrative Radio Conferences** and the structure of the **Radio Regulations**	Geneva
1963		
	International Radio Consultative Committee (CCIR):	
16 January-15 Feb.	Xth Plenary Assembly	New Delhi
	International Telegraph and Telephone Consultative Committee (CCITT):	
5-14 February	**Plan Sub-Committee for Asia**	New Delhi
23 March-26 April	**ITU Administrative Council** (18th Session)	Geneva
4-24 June	**Second Session of the Panel of Experts to consider measures to reduce congestion in the frequency bands between 4 and 27.5 Mc/s**	Geneva
7 October	**Extraordinary Administrative Radio Conference on Space Communications**	Geneva

Invitations accepted to conferences or meetings external to the Union

Date	Organization	Nature of conference or meeting	Place	Representatives
1962				
18 September	United Nations Organization (UNO)	17th Session of the General Assembly	New York	Mr. Gerald C. GROSS (Secretary-General) Mr. J. PERSIN Mr. V. K. SUNDARAM (General Secretariat)
20-29 September	Inter-Governmental Oceanographic Commission	2nd Session	Paris	Mr. F. DELLAMULA (IFRB)
17-18 October	International Organization for Standardization (ISO)	Second plenary meeting of Technical Committee 97: Computers and information processing	Paris	Mr. J. BESSEYRE (CCITT) Mr. H. POULIQUEN (CCIR)
18-30 October	World Meteorological Organization (WMO)	Third Session of the Regional Association for Asia	Bangkok	Mr. T. CLARKSON (ITU's expert)

List of recent and forthcoming publications of the International Telecommunication Union

Note. — A comprehensive list of all the publications of the Union will be supplied free on request.

The following letters indicate the languages in which documents are published :

(F) *for French* **(S)** *for Spanish* **(C)** *for Chinese*
(E) *for English* **(R)** *for Russian*

Prices are in ***Swiss francs.***

I. Publications issued since the last number of the Journal

ITU Administrative Council, 17th Session, 1962.
Resolutions and Decisions
Editions in separate languages **F, E, S.**
Price : 2,— Sw.fr.

Summary of Monitoring Information received by the IFRB
No. 73 (June, 1962).
Trilingual edition **F, E, S.**

International Registration Frequency Board (IFRB):

List of fixed stations operating international circuits, 1st edition, 1 February, 1962.
Trilingual edition **F, E, S.**
Price :

II. Forthcoming publications

Summary of Monitoring Information received by the IFRB.
No. **74** (July, 1962).
Trilingual edition **F, E, S.**

High frequency broadcasting schedules (4 publications per annum).
Trilingual edition **F, E, S.**

Collection showing the action taken by Administrations and private operating agencies in connection with the Optional Provisions of the Telegraph and Telephone Regulations, (Geneva, 1958), 2nd series.
Editions in separate languages **F, E, S.**

List of point-to-point radiotelegraph channels.
Trilingual edition **F, E, S,** possibly **R, C.**

List of fixed stations, 1st edition.
Trilingual edition **F, E, S.**

Alphabetical List of call signs, 1st edition (List VII.B).
Multilingual edition **F, E, S, R, C.**

International Telegraph and Telephone Consultative Committee (CCITT):

Standardized test chart for facsimile telegraphy (including phototelegraphy).
Bilingual edition **F, E** ; possibly **S.**

Directives
Editions in separate languages **F, E, S.**

II Plenary Assembly, New Delhi, 1960.
Red book
Vols. I bis, II bis, III, IV, VI and VII.
Spanish edition.
Vol. V.
Editions in separate languages **F, E, S.**

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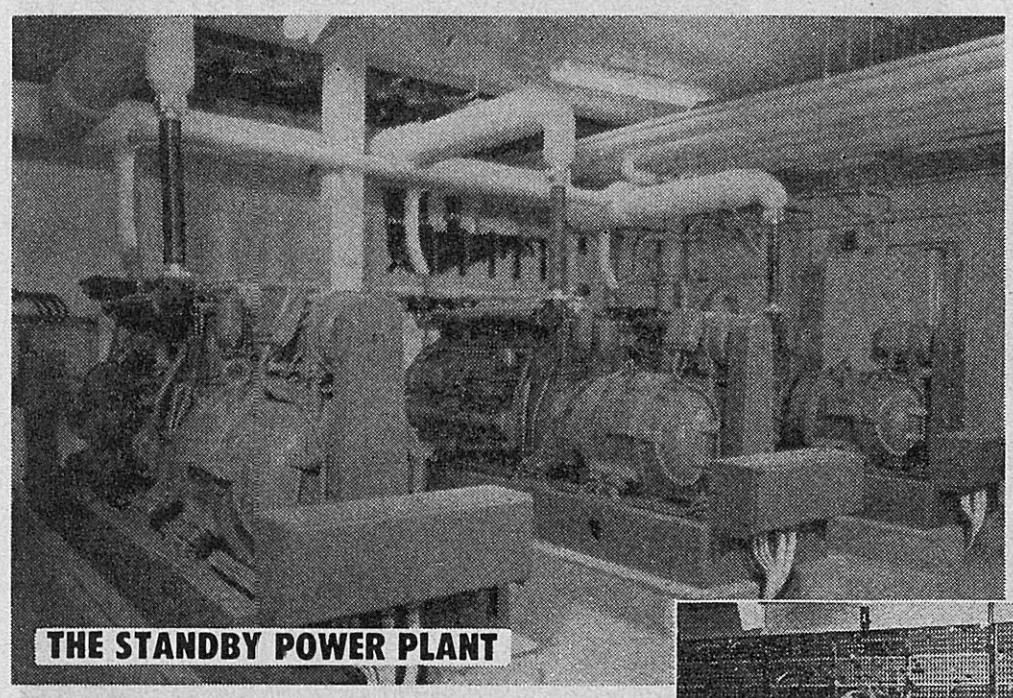

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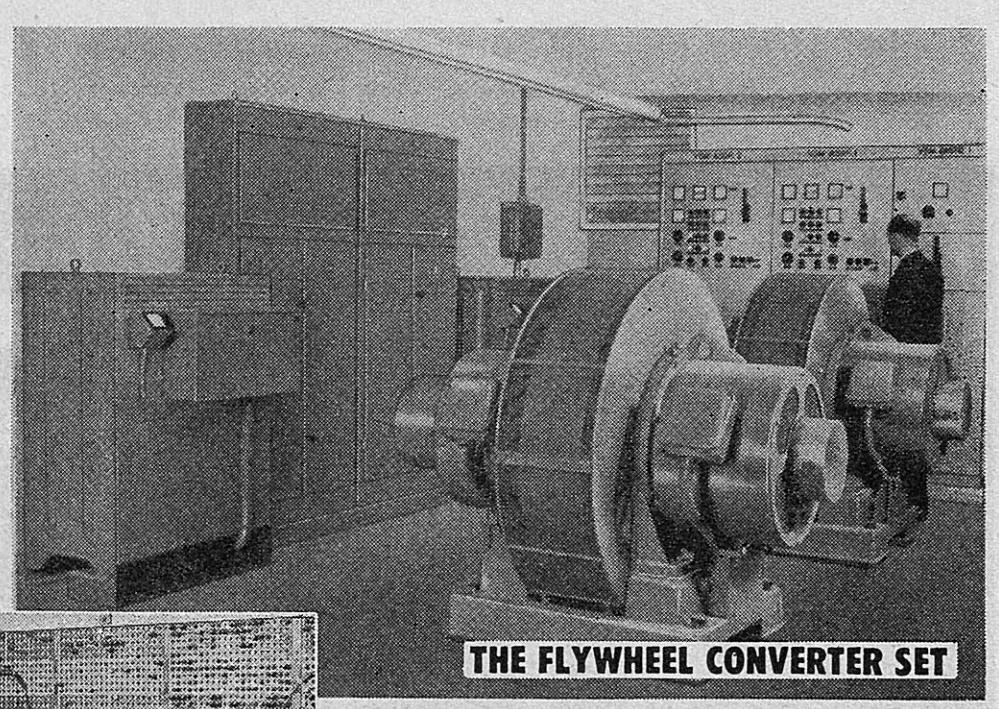

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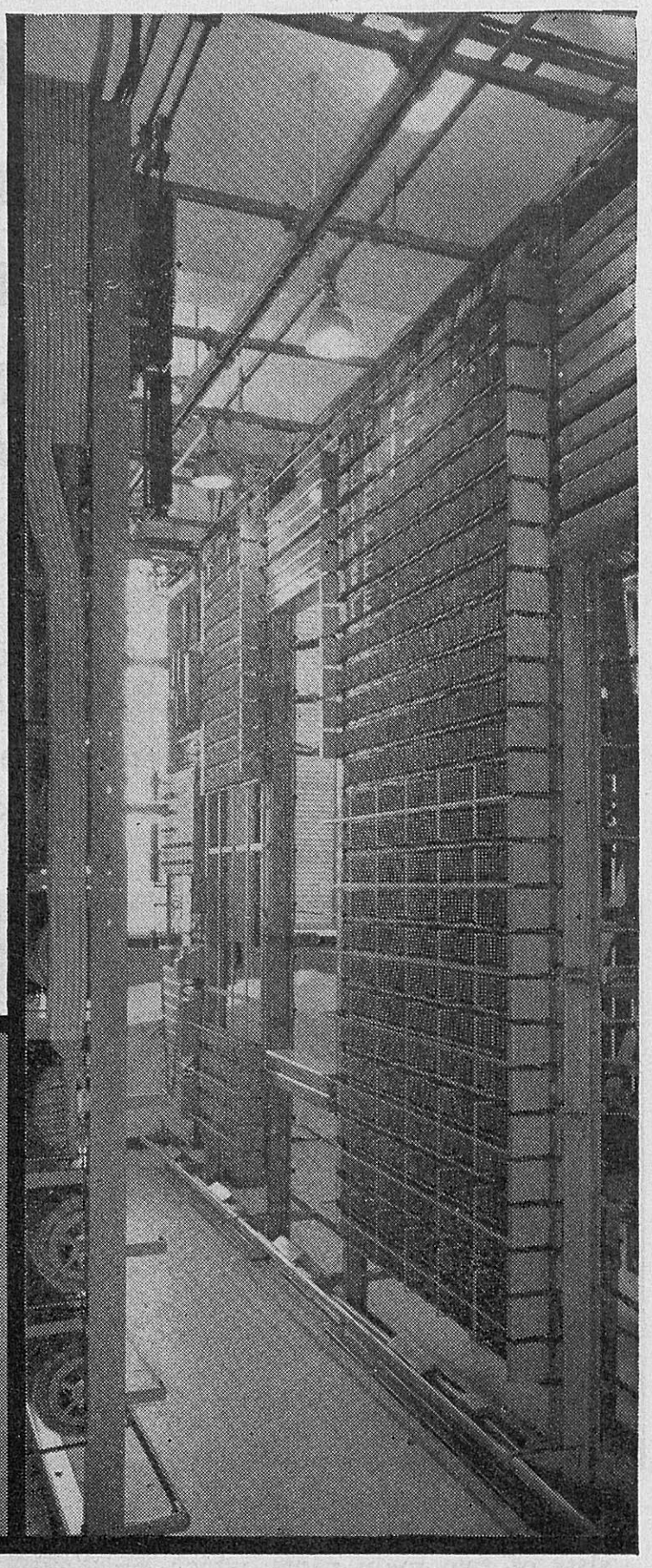

▼ Sender

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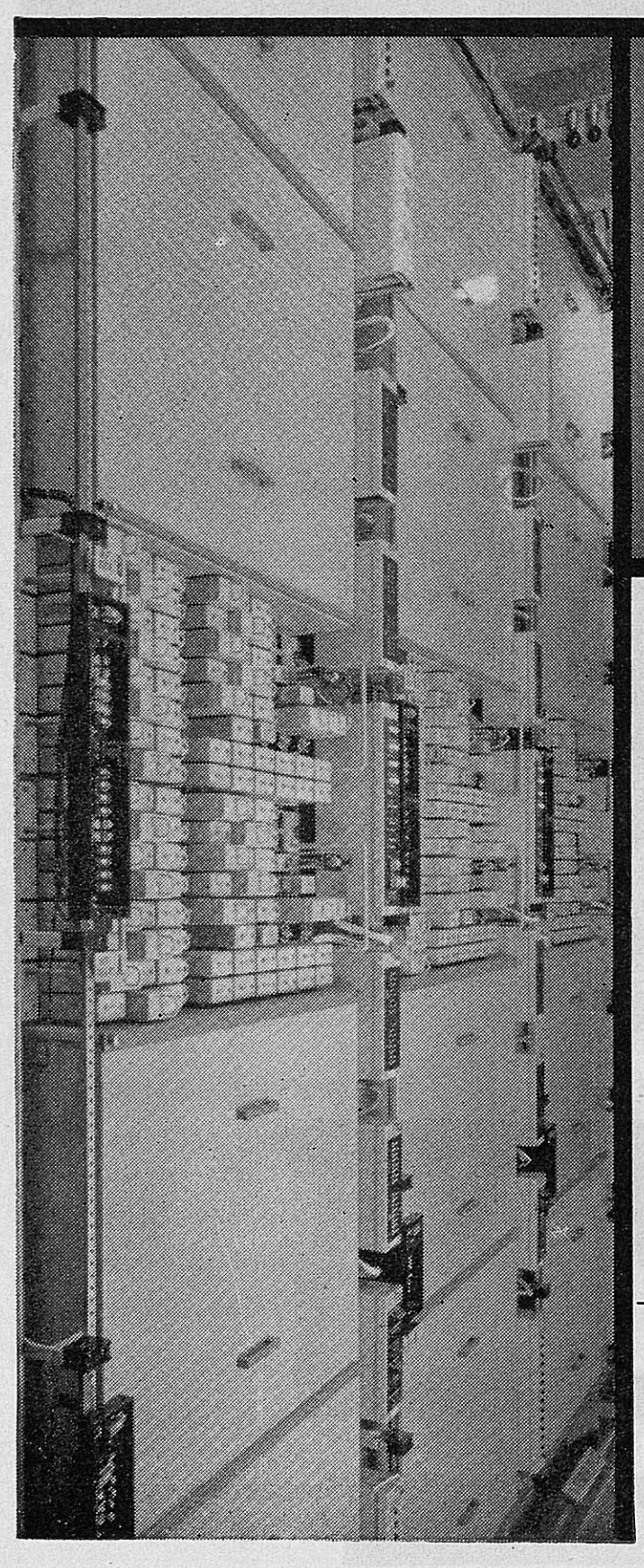

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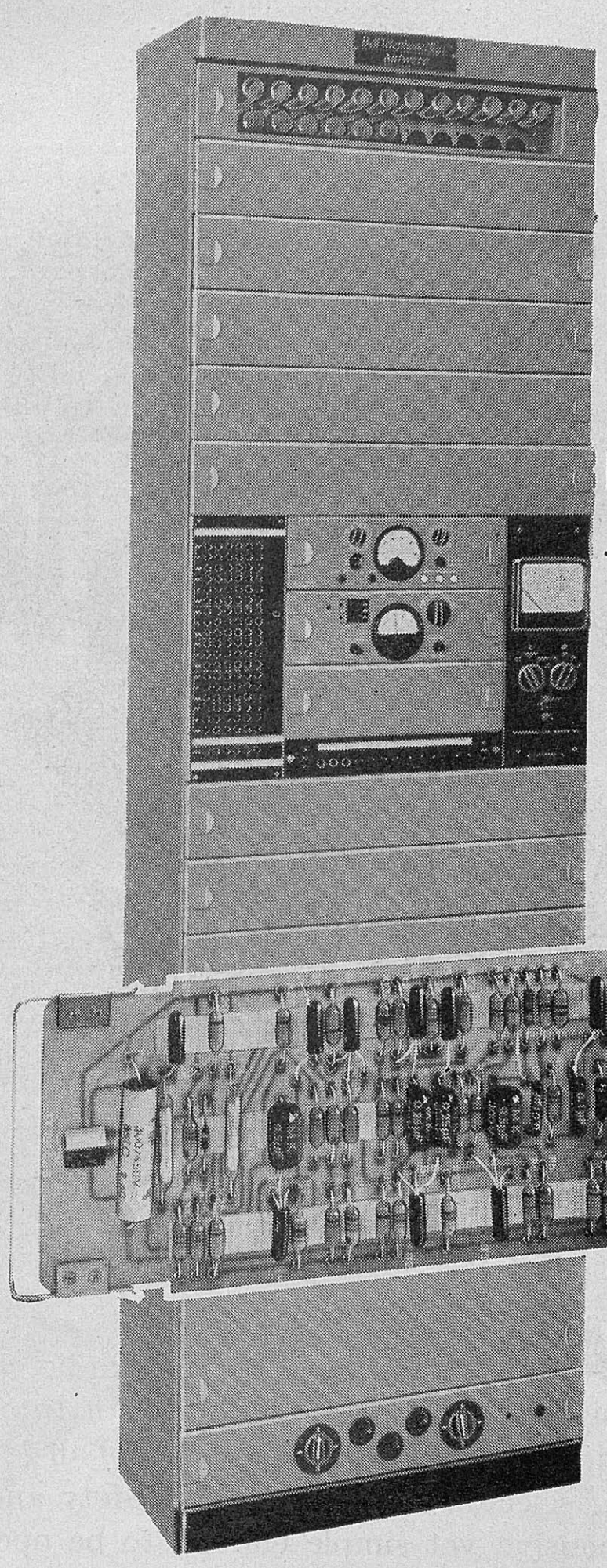

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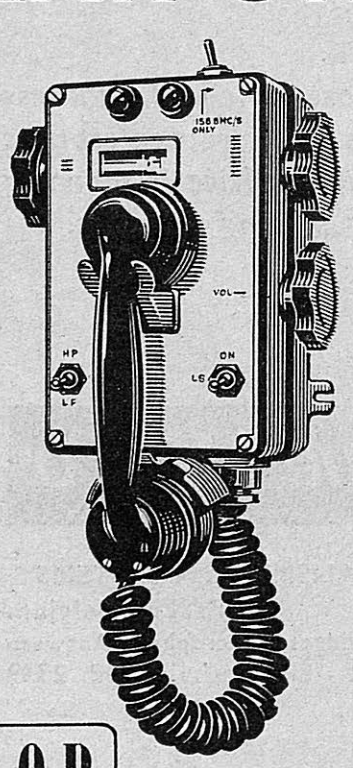

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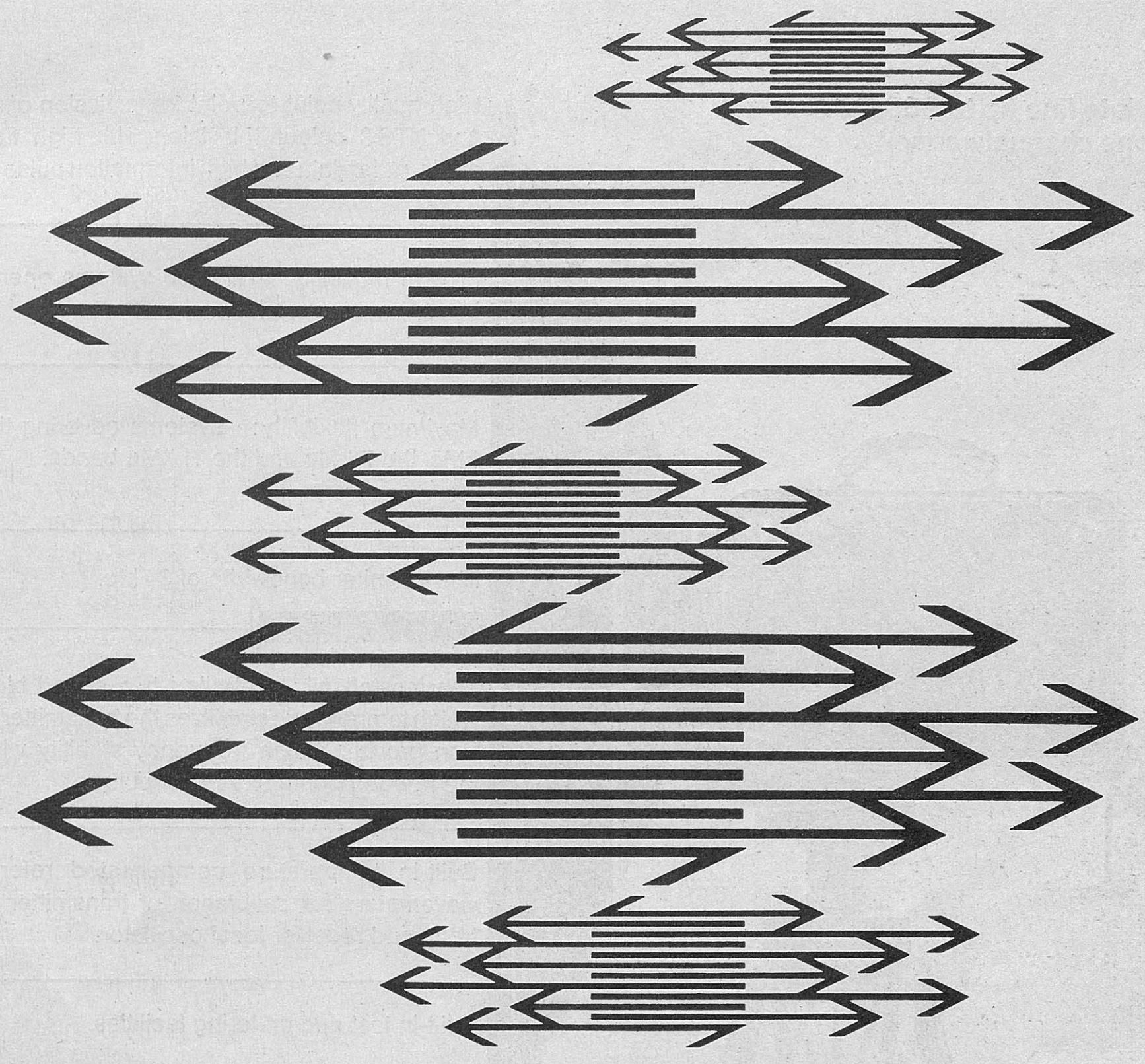

Teleprinters according to CCITT standards.
CCITT 5-unit No 2 alphabet - emission of 7.5 impulse code combinations and reception of 7, 7.42 and 7.5 impulse code combinations.

Send-receive and receive-only tape printing reperforators.
Keyboard perforators with and without local copy on page.
Tape reperforators.
Automatic tape transmitter attachment.
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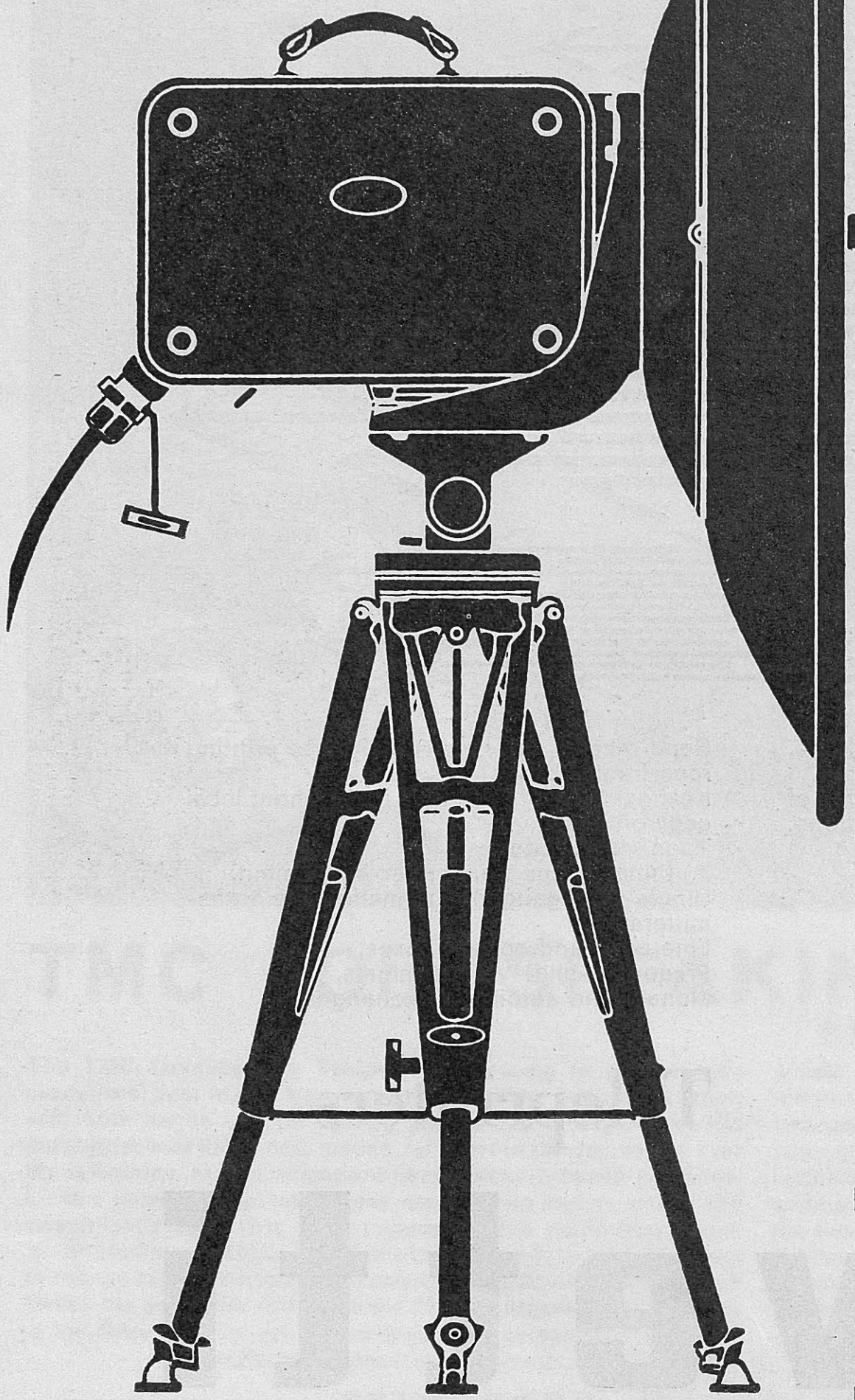
" RAYTHEON microwave relay systems offer:

A complete line up to 960 CCIR telephone channel capacity.



High quality point-to-point transmission of CCIR and NTSC colour television with high fidelity audio, radar data and high information pulse data.

Proven reliability: over 1000 systems operating throughout the world.

Maximum flexibility: systems covering the 4 kMc, the 7 kMc and the 11 kMc bands.

IF and limiter bandwidth of 34 Mc.

Thermostatically controlled two speed blower, which temperature stabilizes the transmitter klystron providing high frequency stability without the need of complex AFC circuits.

Built-in temperature compensated reference wavemeters for calibration of transmitter klystrons and receiver local oscillator.

Built-in test and metering facilities.

Easy operation and maintenance.

Portable or rackmounted!

Raytheon microwave relay systems have been chosen by various Government Agencies in Europe.

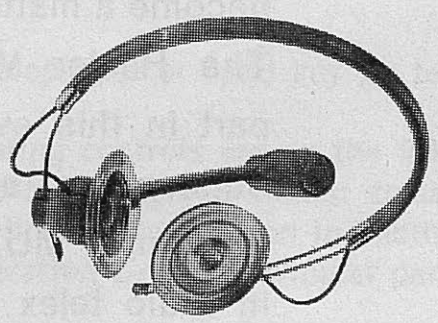
RAYTHEON

Please address your inquiry for more specific information to:
RAYTHEON AG, Alpenstrasse 1, Zug/Switzerland

All-dynamic headphone-microphone combination

The best in headphones combined with the best in microphones: crystal clear sound reproduction plus anti-noise true-fidelity pick up.

The K 58 is a combination of the world-famous K 50 headphones with the brand new D 58 dynamic anti-noise microphone. The headphones reproduce the wave form of the original with an unusually high fidelity. The method of transferring electrical energy to acoustic energy is basically dynamic, but unlike all other transmitters, the K 58 is a first order system. No tight coupling to the ear is necessary, nor bulky resonators or hot air-tight enclosures.



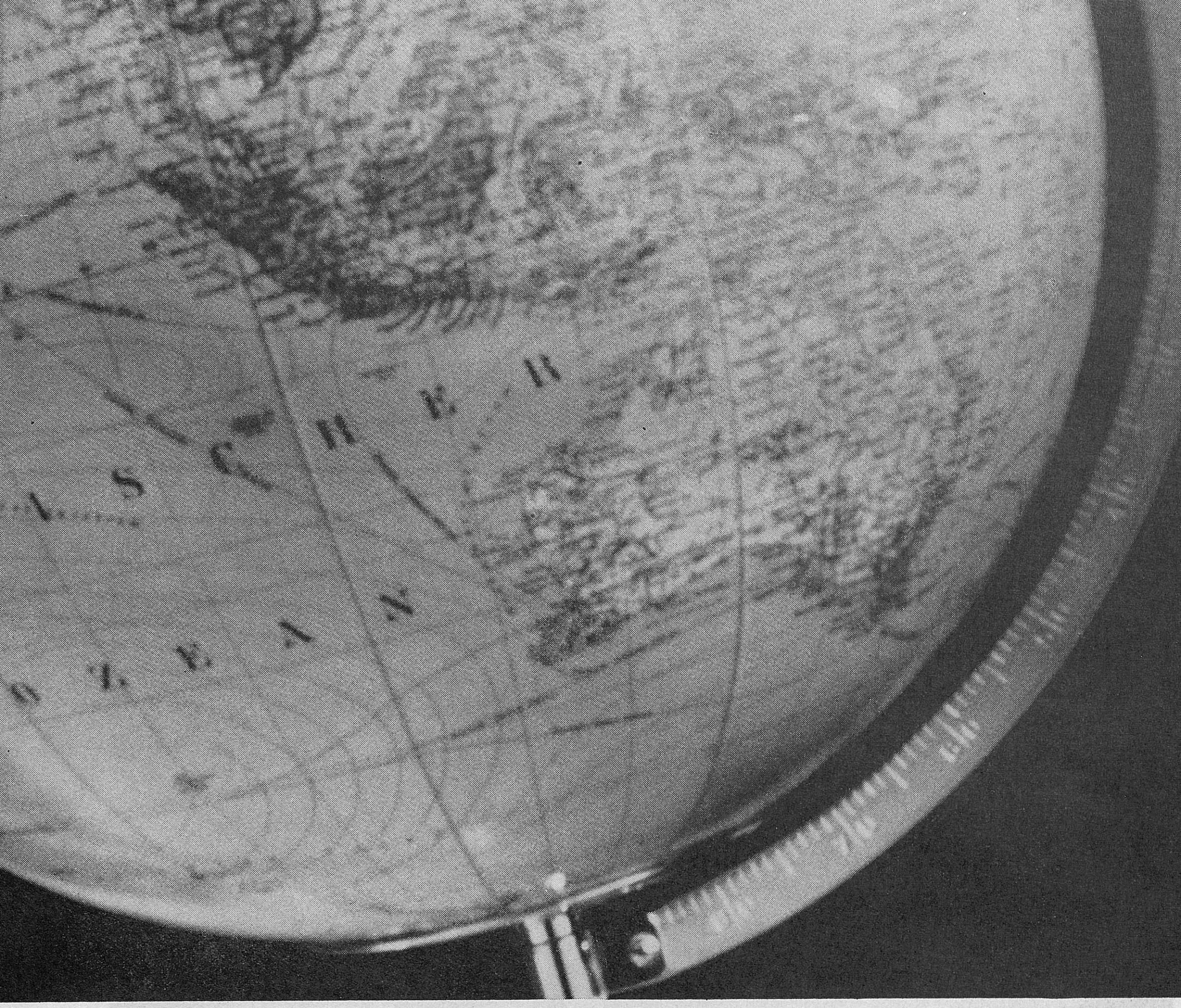
K58

The microphone of the K 58 utilizes a differential principle. Only sound, originated very close to the microphone, is picked up. A special diaphragm permits use of this dynamic microphone even in iron dust atmosphere.

Hands remain free for other activities, there is no fatigue, even after long hours of use.

Best choice for: Audio visual teaching, Intercommunication systems, Broadcast and TV reporters, Dispatching systems, Supervision and control centres for industry, traffic, and communication operations, Systems where the microphone is used near loudspeakers. Best intelligibility under most severe conditions: if this is the aim the K 58 is your choice.

For details of other AKG products, see your Dealer or write to Akustische u. Kino-Geräte Gesellschaft m.b.H., Vienna 15., Nobilegasse 50. Cable address: MICROPHONE WIEN, Telex No. 01 1839.



PR 2/1962

It's a small world

Distance is no object nowadays. Modern means of communication link up nations and continents instantaneously. What used to be an impossibility has become a matter of course.

The Hasler Works have been taking a purposeful part in this evolution for over a hundred years. One outstanding example is the electronic Hasler-TOR System, a MUX-ARQ Equipment which detects errors in radio telex traffic and corrects them automatically. This technical masterpiece is at work in every continent, day and night, year after year, non-stop and quite untended.

It is with achievements like this that we endeavour to give our worldwide clientele ever better service.

For 110 years

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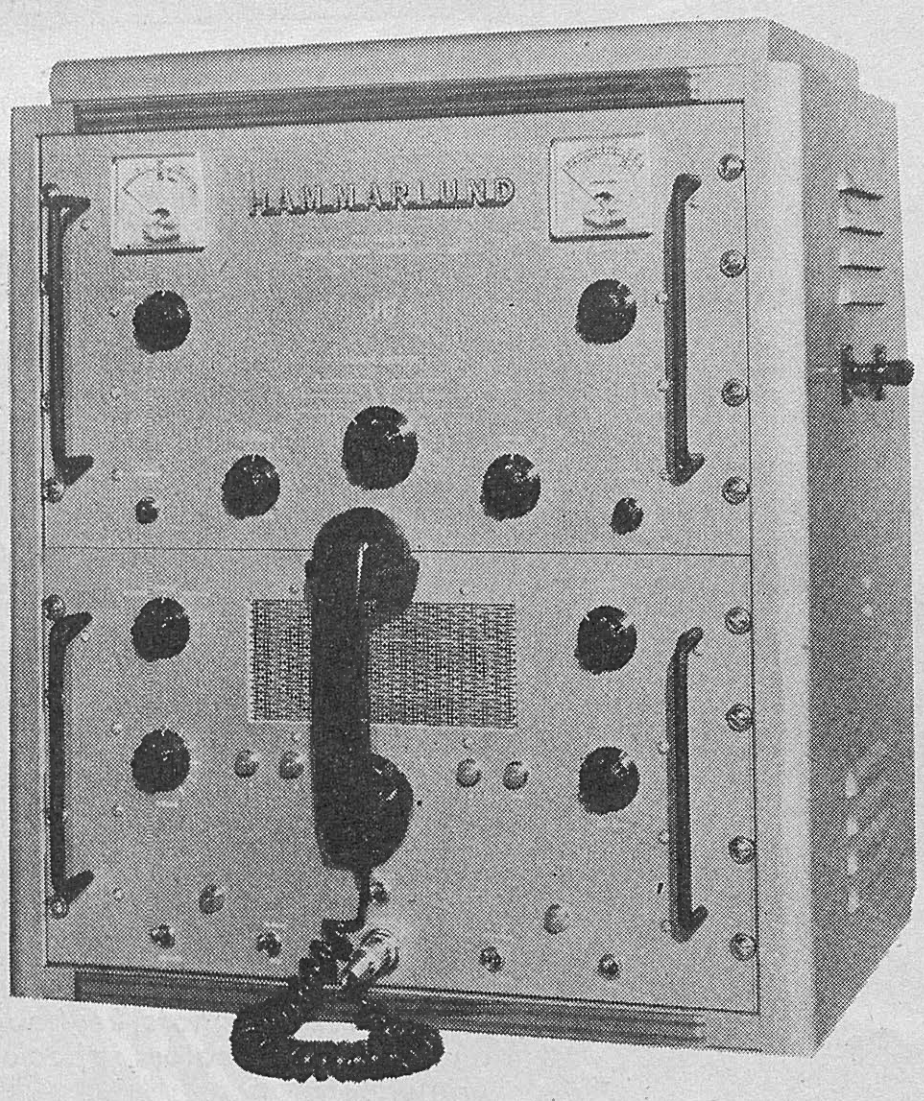
HAMMARLUND
NEW TRANSMITTER-RECEIVER



100 WATTS
• HIGH FREQUENCY •
TOP EFFICIENCY
• REAL ECONOMY

Utilizing the principle of single-sideband transmission for point-to-point networks, this model represents a new concept in medium and short-range communication between points where no land line facilities exist. Based on a system in use since 1926 for international radiotelephone communications, the new transmitter-receiver is superior to conventional AM in three important ways: less distortion, less interference, more privacy.

The new transmitter-receiver solves both of the fundamental problems inherent in high frequency transmission by AM methods: reduces the bandwidth necessary for high frequency transmission, thus relieving the increasingly more crowded high frequency spectrum, and provides greater coverage without increase in power consumption.

- **ECONOMICAL** – simplified construction brings cost below the cost of standard double-sideband AM equipment of equal effectiveness.
- **RELIABLE** – based on system in use since 1926 for international radiotelephone communications.
- **EFFICIENT** – in use of power as well as frequency space. Approximately eight times more efficient than conventional AM transmitters.
- **EFFECTIVE** – superior to conventional AM in three important ways: **less distortion, less interference, more privacy.**
- **VERSATILE** – can be used with teleprinter or hand key for telegraphy.
- **EASILY CONTROLLED** – all operating controls are on the front panel and reduced to a minimum; permit instantaneous slection of: one of four pretuned crystal-controlled channels; phone or telegraphy; speaker, local handset or remote line for connection in another office, telephone line or teleprinter, etc. Designed for operation by non-technical personnel.

LOW COST AND ADAPTABILITY OF THE CSB100TR PERMIT EXPANSION OF EXISTING AM SYSTEMS AND FACILITATE SYSTEMATIC RETIREMENT OF ALL DOUBLE-SIDEBAND HF EQUIPMENT.

Write today for full details and catalog on this and other HAMMARLUND Communication Equipment Dept. TCJ

HAMMARLUND Manufacturing Company, Inc.
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SAGEM

terminaux

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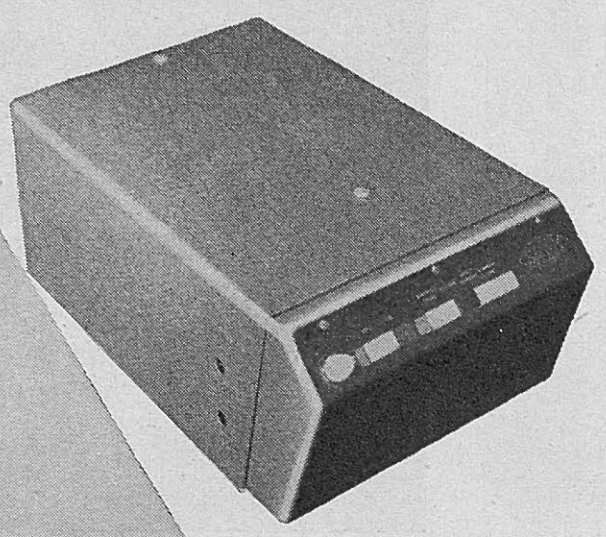

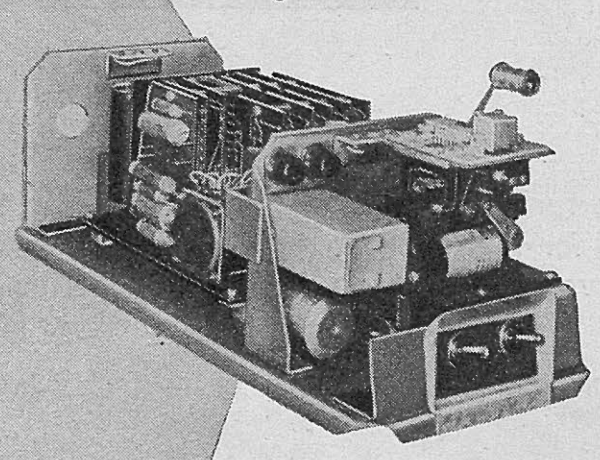

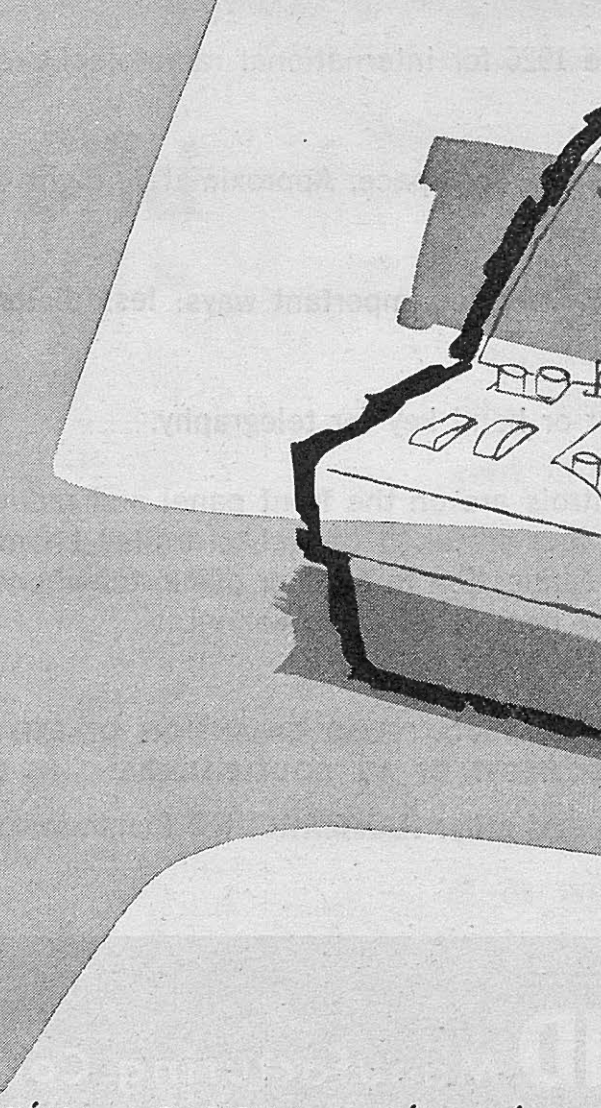

SAGEM propose une gamme d'accessoires pour satisfaire toutes les demandes :

- Téléimprimeur à page et à bande, émetteur-récepteur, perforateur imprimant, clavier perforateur à page, coffrets spéciaux, dispositifs pour imprimés, etc...
- Appareils pour réseaux Duplex tels qu'armoires de transit, matériels de chiffrement, transmetteur numéroteur transistorisés, etc..

SAGEM offers a range of equipment to meet all requirements :

Page and tape printers, RCV-SEND sets, printing reperforators, keyboard page and tape perforators, special units, printer sets,

Duplex system units, such as transit center equipment, ciphering attachments or repeaters, solid state message numbering transmitters, etc...

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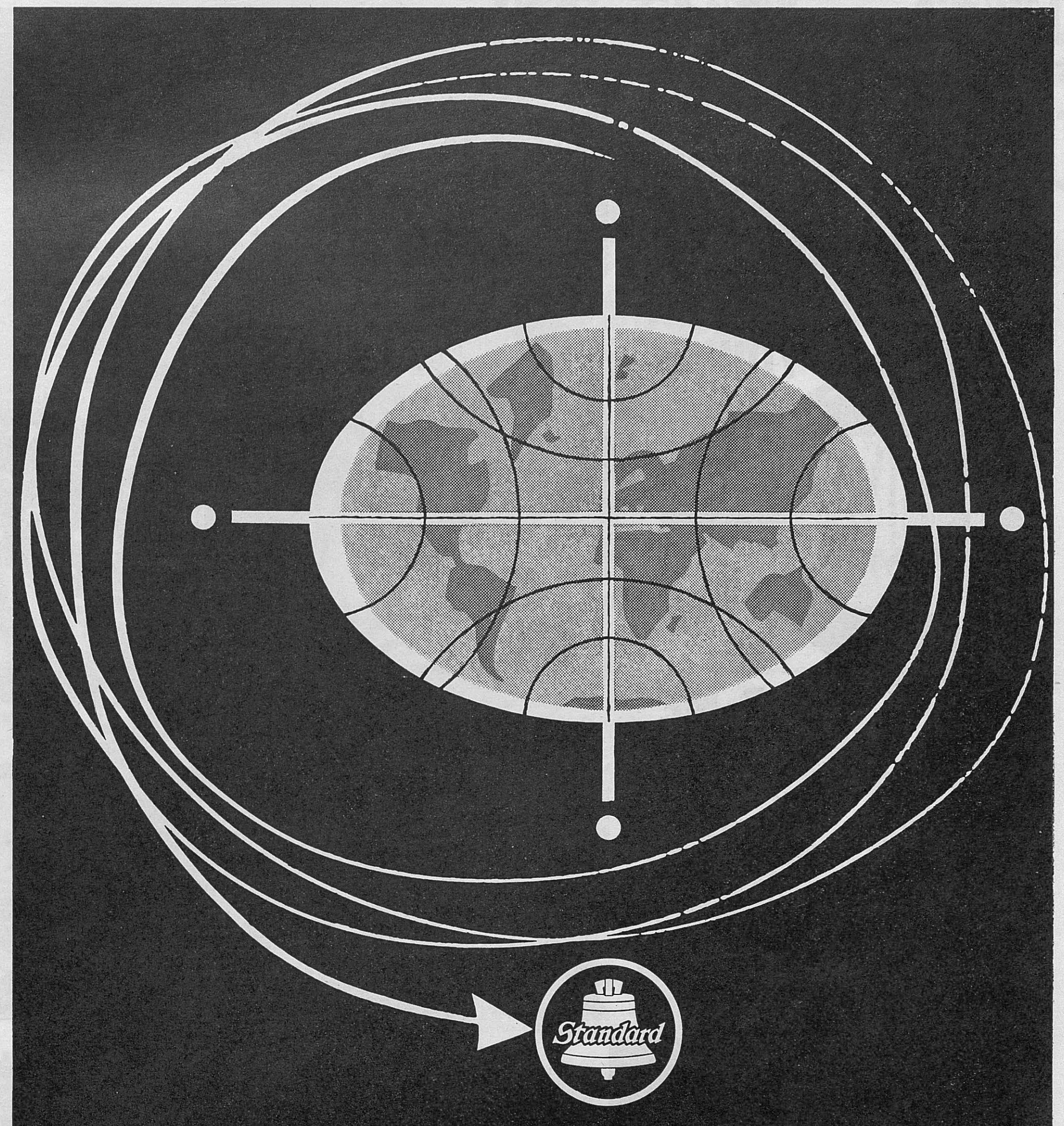

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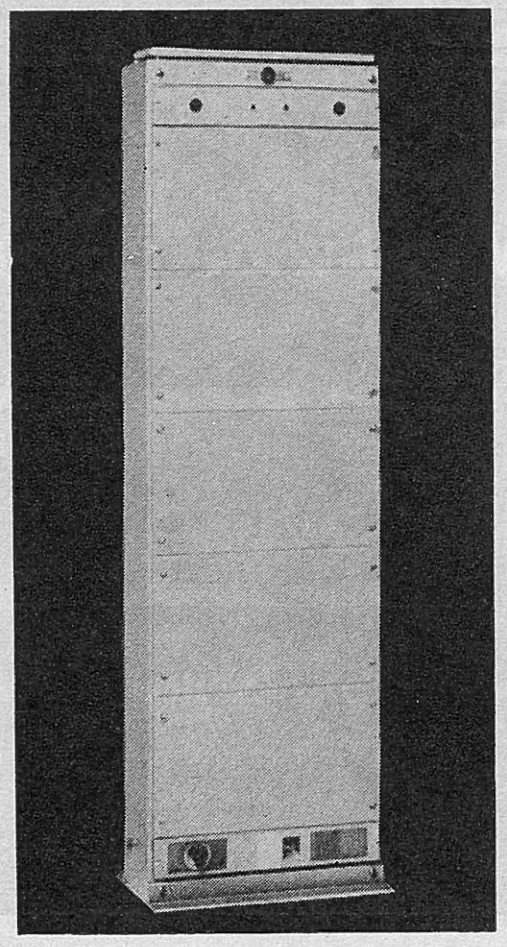

"Communications are completely disrupted. Only the Multi Channel Radio Links are still functioning."
In conditions like these—the aftermath of a recent hurricane in the West Indies—the only telephone circuits still likely to be in operation are those extended over Radio Links.
Fire, flood, earth-quake, sabotage, can inflict the same costly damage and put whole net-works out of action for days, or even weeks on end. In parts of the world where such hazards are expected, and particularly when the terrain is difficult and the construction of pole routes impractical or prohibitively expensive, Administrations are specifying Multi Channel Radio Systems.
The A.T.E. Type 900 is a wide band VHF/UHF Radio Equipment with in-built transistor multiplexing equipment, capable of carrying 1 + 4 speech or a number of Telegraph Channels, and is designed to meet small Junction Radio requirements for just this kind of service. Special terminating arrangements are provided, to enable the Type 900 to be linked into most types of manual or automatic exchange.
Versions covering the frequency bands 156/184 *Mc/s.*, 220/260 *Mc/s., and* 430/500 *Mc/s. are available. The equipment is designed for continuous mains operation under all climatic conditions and is robust, compact and easy to maintain.*

For further information write for Bulletin No. P.I.B. 104

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SPECIFY A.T.E. FIVE CHANNEL TYPE 900 FOR YOUR TIE-LINE AND MINOR JUNCTION REQUIREMENTS.

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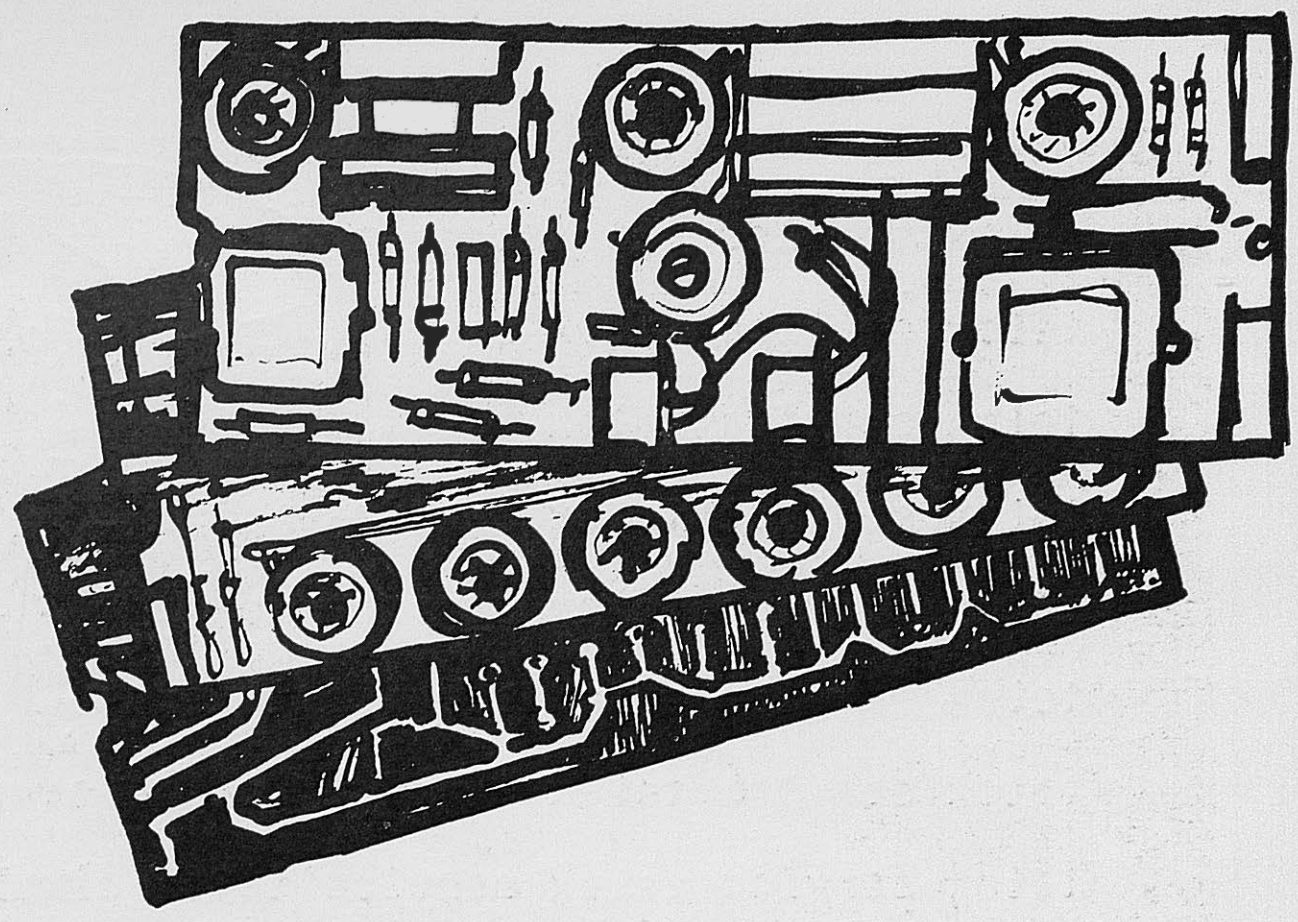

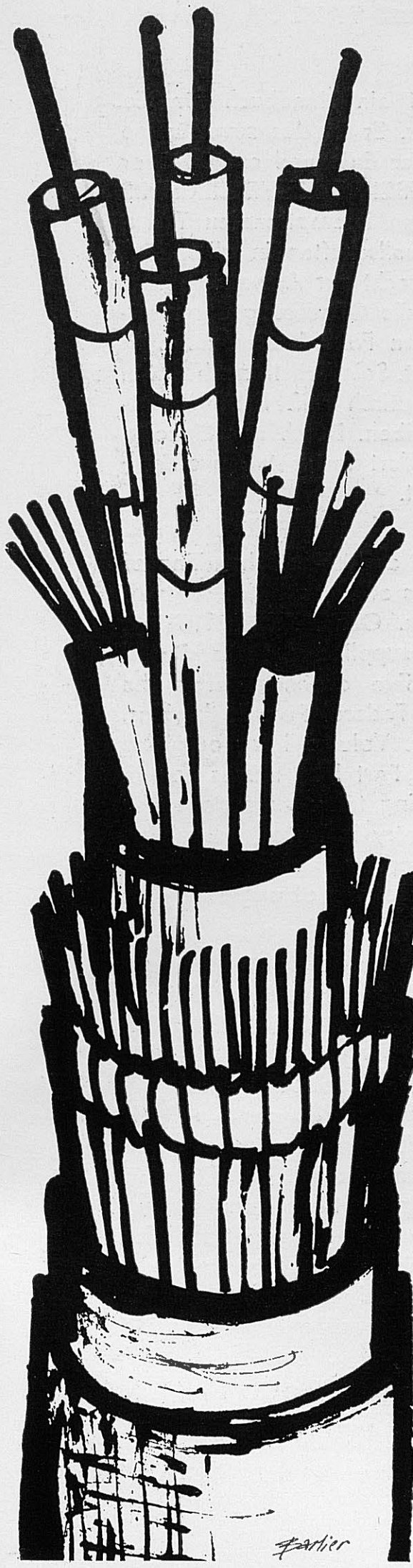

TÉLÉCOMMUNICATIONS

Ayant participé depuis le début du siècle au développement du réseau téléphonique français à grande distance, la S.A.C.M. poursuit sa collaboration avec l'Administration Française des Postes et Télécommunications.
S.A.C.M. étudie et construit :

- des câbles de télécommunication à grande distance avec leurs équipements de téléphonie multiplex à courant porteur et leurs répéteurs.

S.A.C.M. poursuit ses études dans le domaine des techniques impulsionnelles et construit notamment :

- un équipement de transmission à grande distance, sur circuit téléphonique normal, de données numériques binaires à la cadence de 1.500 impulsions-chiffres par seconde.
- un équipement téléphonique multiplex à modulation en delta, se prêtant particulièrement bien à l'adaptation de dispositifs de secret.

La S.A.C.M. fournit et installe enfin l'essentiel des équipements basse-fréquence de radiodiffusion :

- prise de son ; distribution des modulations ; magnétophones fixes.

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INTERNATIONALES FERNSCHREIBER-VERZEICHNIS ist ein Handbuch für die reibungslose und schnelle Abwicklung des Telexverkehrs. Es ist das zuverlässige Verzeichnis der Fernschreibteilnehmer aus 67 Ländern der Erde und enthält über 85 000 genaue Adressen. Unser INTERNATIONALES FERNSCHREIBER-VERZEICHNIS ist bearbeitet nach den amtlichen Informationen der am internationalen Telexverkehr beteiligten Postverwaltungen und Telegrafengesellschaften in allen fünf Kontinenten. Für Deutschland hat der Verlag das Alleinrecht zur Auswertung der amtlichen Unterlagen der Deutschen Bundespost. So ist die Gliederung der zweibändigen Plastikausgabe : Band I dient dem abgehenden Fernschreibverkehr. In seinem Teil I sind die Firmennamen alphabetisch geordnet. Sein Teil II, nach Orten unterteilt, führt innerhalb der Orte die Firmen alphabetisch auf. Band II entschlüsselt die Namengeber der ankommenden Fernschreiben. Durch das Einheits-Alphabet kann jeder Absender eines Fernschreibens sofort festgestellt werden ; gleichgültig, aus welchem Land das Fernschreiben kommt.

INTERNATIONAL TELEX-SERVICE is a handbook ensuring prompt and smooth handling of telex messages. This reliable directory of telex-subscribers of 67 countries contains more than 85 000 exact addresses of telex-subscribers. Our INTERNATIONAL TELEX SERVICE is compiled from official information supplied by the Postal Administrations and Private Cable Companies of all five continents. For the German part : sole right to use official records of the Federal Post Authorities. Here is how it looks like : Two plastic coated volumes. Volume I for outgoing telex messages : All addresses in alphabetical order. In Part I by names and in Part II by places and by names. Volume II for becoming telex messages : The alphabetical list of the answer-back codes with the country indicated, containing all telex-subscribers of 67 countries. So every telex-subscriber is able to identify immediately the sender of a telex message whichever the country of origin may be.

ANNUAIRE INTERNATIONAL TELEX est un manuel créé pour permettre des communications télex rapides. C'est un répertoire éprouvé des abonnés télex répartis sur 67 pays du monde et contenant plus de 85 000 adresses exactes. Notre ANNUAIRE INTERNATIONAL TÉLEX est mis au point conformément aux renseignements officiels qui nous sont fournis par les administrations des PTT de cinq continents. En République fédérale l'éditeur est habilité à titre exclusif à utiliser les documents officiels de la Poste fédérale allemande. L'ouvrage se compose de 2 volumes sous reliure plastique : Le volume N° 1 sert au départ des communications télex. Dans sa première partie les entreprises sont classées par ordre alphabétique. Sa deuxième partie comporte un classement géographique qui prévoit le recensement des entreprises alphabétiquement à l'intérieur de leur domiciliation. Le volume N° II donne la liste des indicatifs des abonnés. Grâce à l'ordre alphabétique de ceux-ci, tout expéditeur d'un message télex peut être aussitôt retrouvé quel que soit le pays dont le message provient.

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